Australian Government
Civil Aviation Safety Authority

ADVISORY CIRCULAR
AC 119-04 v1.0

Flight Data Analysis Programmes (FDAP) for air transport operations

Date	October 2021
Project number	OS 99/43
File ref	D13/402932

For Flight Operations Regulations commencing on 2 December 2021

Advisory circulars are intended to provide advice and guidance to illustrate a means, but not necessarily the only means, of complying with the Regulations, or to explain certain regulatory requirements by providing informative, interpretative and explanatory material.

Advisory circulars should always be read in conjunction with the relevant regulations.

Audience

This advisory circular (AC) applies to Air Operator's Certificate (AOC) holders operating under the Part 119 of the *Civil Aviation Safety Regulations 1998* (CASR) – Air Transport Operations who are operators conducting air transport operations.

Purpose

This AC is for Part 119 operators performing air transport operations with aeroplanes and helicopters. The objective is to provide:

- a description of the relationship between safety management systems (SMS) and flight data analysis program (FDAP)
- an overview of FDAP elements
- and guidance for the establishment and implementation of an FDAP.

For further information

For further information, contact CASA's Flight Operations Branch (telephone 131 757).

Status

This version of the AC is approved by the Branch Manager, Flight Operations.

Version	Date	Details
v1.0	October 2021	This is the first AC to be issued on this subject. It is an update of Civil Aviation Advisory Circular (CAAP) SMS-4(0) Guidance on the establishment of a Flight Data Analysis Program (FDAP) — Safety Management Systems (SMS); August 2011.

Unless specified otherwise, all subregulations, regulations, Divisions, Subparts and Parts referenced in this AC are references to the *Civil Aviation Safety Regulations 1998 (CASR)*.

Contents

1 Reference material

1.1 Acronyms

The acronyms and abbreviations used in this AC are listed in the table below.

Acronym	Description
AC	advisory circular
ADRS	aircraft data recording systems
ATC	air traffic control
CAR	*Civil Aviation Regulations 1988*
CASA	Civil Aviation Safety Authority
CASR	*Civil Aviation Safety Regulations 1998*
FDM	Flight Data Monitoring
FDR	flight data recorder
FOQA	Flight Operational Quality Assurance
LOSA	Line Operations Safety Audit(s)
QAR	quick access recorder
SDCPS	safety data collection and processing system
SOP	standard operating procedure

1.2 Definitions

Terms that have specific meaning within this AC are defined in the table below. Where definitions from the Regulations have been reproduced for ease of reference, these are identified by grey shading. Should there be a discrepancy between a definition given in this AC and the Regulations, the definition in the Regulations prevails.

Term	Definition
corrective action	means action, the purpose of which is not punitive: a. that is taken to address particular safety-related shortcomings or deficiencies such as an authorisation holder who is unable or unwilling to demonstrate compliance with applicable safety or competency standards; and b. that may involve restricting, limiting, conditioning or suspending the ability of an authorisation holder to exercise the privileges of a civil aviation authorisation. Note: Examples of corrective action are requiring an individual authorisation holder to undertake training, and the introduction of changed processes or procedures by an organisation that holds an authorisation.

Term	Definition
flight data analysis	ICAO defines this as a process of analysing recorded flight data to improve the safety of flight operations.
preventative action	means action, the purpose of which is not punitive: a. that is taken to prevent the occurrence or recurrence of an event or a hazard that poses a risk to safety; and b. that may involve restricting, limiting, conditioning or suspending the ability of an authorisation holder to exercise the privileges of a civil aviation authorisation. Note: Examples of preventive action are requiring an individual authorisation holder to undertake training, and the introduction of changed processes or procedures by an organisation that holds an authorisation.
remedial action	means action, the purpose of which is not punitive: a. that is taken to address the underlying causes of particular safety-related shortcomings or deficiencies; and b. that may involve restricting, limiting, conditioning or suspending the ability of an authorisation holder to exercise the privileges of a civil aviation authorisation. Note: Examples of remedial action are requiring an individual authorisation holder to undertake training, and the introduction of changed processes or procedures by an organisation that holds an authorisation.
safety data	A defined set of facts or set of safety values collected from various aviation-related sources, which is used to maintain or improve safety. Note: Such safety data is collected from proactive or reactive safety-related activities, including but not limited to: a. accident or incident investigations; b. safety reporting; c. continuing airworthiness reporting; d. operational performance monitoring; e. inspections, audits, surveys; or f. safety studies and reviews.
safety information	means any safety data or information, in any form, generated within, or captured, collected or held by and within, an operator's approved safety management system, including personal information relating to individuals. Note: Some approved SMSs must include an FDAP — see subparagraph 2A.2 (e). An approved SMS may include other kinds of safety data collection and processing systems — subsection 2A.2 sets out minimum requirements for an SMS.

1.3 References

Legislation

Legislation is available on the Federal Register of Legislation website https://www.legislation.gov.au/.

Document	Title
Part 119	Australian air transport operations—certification and management
CASA EX82/21	Part 119 of CASR – Supplementary Exemptions and Directions Instrument 2021
CASA EX86/21	Part 138 and Part 91 of CASR – Supplementary Exemptions and Directions Instrument 2021

International Civil Aviation Organization documents

International Civil Aviation Organization (ICAO) documents are available for purchase from http://store1.icao.int/.

Document	Title
Annex 6	Operation of Aircraft, Part 1, International Commercial Air Transport – Aeroplanes
Annex 19	Safety Management
Doc 9859	Safety Management Manual (SMM)
Doc 10000	Manual of Flight Data Analysis Programmes (FDAP)

Advisory material

CASA's advisory material is available at https://www.casa.gov.au/publications-and-resources/guidance-materials.

Document	Title
AC 119-01	Safety Management Systems for air transport operations

Other

Document	Title
	European Authorities Coordination Group on Flight Data Monitoring (EAFDM) - Good Practice on the Oversight of Flight Data Monitoring Programmes (version 1)
FAA AC 120-82	Flight Operational Quality Assurance (faa.gov)
HFDM-RP-v1.0-1	HeliOffshore - Helicopter Flight Data Monitoring (HFDM) - Recommended Practice for Oil and Gas Passenger Transport Operations
UK CAA CAP739	Flight Data Monitoring (caa.co.uk)

2 Flight data analysis program

2.1 Background and context

2.1.1 FDAPs are increasingly being used to monitor and analyse flight operations and engineering performance. They are a mandatory type of safety data collection and processing system (SDCPS) of the SMS for operators of certain aircraft as specified in regulation 119.195[1]. Other operators might choose to implement an FDAP at their discretion.

2.1.2 An FDAP may be described as a non-punitive program for routine collection and analysis of flight data to develop objective and predictive information for advancing safety, for example, through improvements in flight crew performance, training effectiveness, operational procedures, maintenance and engineering, and air traffic control (ATC) procedures.

2.1.3 More generically, flight Data Analysis (FDA), sometimes referred to as Flight Data Monitoring (FDM) or Flight Operational Quality Assurance (FOQA), provides a systematic tool for the proactive identification of hazards. FDA is a complement to hazard and incident reporting and to Line Operations Safety Audits (LOSA).

2.1.4 ICAO defines flight data analysis as a process of analysing recorded flight data to improve the safety of flight operations.

2.1.5 FDA involves:

- capturing and analysing flight data to determine if the flight deviated from a safe operating envelope
- identifying trends
- promoting action to correct potential problems.

2.1.6 Periodically, flight data are transferred from the aircraft and analysed by the ground analysis system at a centralised location.

2.1.7 Deviations of more than certain predetermined values, called exceedances, are flagged and evaluated. The FDA team will propose and evaluate corrective actions, as well as produce exceedances aggregation over time to determine and monitor trends. FDA also allows for early identification of aircraft system degradation for maintenance action.

2.2 Objectives of a flight data analysis program

2.2.1 The objectives of an FDAP are to:

- determine operating norms

[1] Sections 18 and 19 of CASA EX82/21, and section 22 of CASA EX86/21, may apply to certain operators. These legislative instrument sections contain, for CASA EX82/21, an exemption from provisions of regulation 119.195 and a direction relating to the management of safety information, and for CASA EX86/21, a direction relating to the management of safety information.

- identify potential and actual hazards in operating procedures, fleets, aerodromes, ATC procedures etc.
- identify trends
- monitor the effectiveness of corrective actions taken
- provide data to conduct cost-benefit analyses
- optimise training procedures
- provide actual rather than presumed performance measurement for risk management purposes.

2.2.2 Successful FDAPs not only encourage adherence to standard operating procedures (SOPs), but also determine non-standard behaviour, thereby improving safety performance. They can detect adverse trends in any part of the flight regime and, thus, facilitate the investigation of events, including those which have had serious consequences.

2.2.3 Flight data analysis can be used to identify non-standard or deficient procedures, weaknesses in the air traffic control (ATC) system and anomalies in aircraft performance. FDA allows the monitoring of various aspects of the flight profile, such as the adherence to the prescribed take-off, climb, cruise, descent, approach and landing SOPs. Specific aspects of flight operations can be examined either retrospectively to identify problem areas, or proactively to introduce operational change, and subsequently to confirm the effectiveness of a change.

2.2.4 During incident analysis, flight data of the related flight can be compared with the fleet profile data, thereby facilitating analysis of the systemic aspects of an incident. It may be that the parameters of the incident-flight vary only slightly from many other flights, possibly indicating a requirement for change in operating technique or training. For example, it would be possible to determine whether a tail-scrape on landing was an isolated event, or symptomatic of a wider mishandling problem, such as over-flaring on touchdown or improper thrust management.

2.2.5 Engine monitoring programs may utilise FDAP data for reliable trend analysis, as manually coded engine data are limited in terms of accuracy, timeliness and reliability. It is also possible to monitor other aspects of the airframe and systems.

2.2.6 Subject to the comment in Section 5 of this AC, it is important that FDAPs are non-punitive and contain adequate safeguards to protect the source(s) of the data[2], subject to the provision of it to:

- a person whose duties require that person to analyse operational flight data
- a person who has access to the identified person's identity solely for the purpose of analysing operational flight data
- a pilot appointed by the operator to liaise with flight crew in relation to matters arising from the flight data analysis program
- anyone with the written consent of the person

[2] A data source might be a person who reports, or is the source of, or is the subject of, operational flight data.

or

- anyone as required by CASA[3]

or

- anyone as required or authorised by law to receive it.

2.2.7 In summary, FDAPs offer a wide spectrum of applications for safety management and also offer the benefit of improving operational efficiency and economy that compensate a required investment.

2.3 FDAP integrated within SMS

2.3.1 FDA aims to enable the continuous improvement of an operator's overall safety performance, and it should be integrated in the safety assurance component of the operator's SMS. Ideally, where multiple systems are utilised to identify hazards and manage risk, they should be integrated to maximise their combined effectiveness, ensure resources are being distributed appropriately across the systems and, where possible, to reduce duplicated processes for greater system efficiency.

Note: While an operator may choose to 'contract out' the responsibility for the management of the FDAP, the accountability at all times remains with the operator and any hazards associated with using a contracted entity should be assessed under the operator's SMS in a similar way to other third parties who may impact the safety outcomes of the operator. For further information, see section 8.2 of AC 119-01.

2.3.2 For example, when integrated as part of an operator's SMS safety assurance processes, an FDAP will have identified indicators or parameters chosen for measuring and monitoring the operator's safety performance, including operational events. These events may be low consequence (deviation, non-compliance events), or high consequence safety performance indicators (accident and serious incident rates). Such data are routinely fed into or become part of the SDCPS.

2.3.3 The operator's SMS assurance processes would also have procedures for corrective or follow-up action to be taken when targets are not achieved and/or alert levels are breached that are set for each of the performance indicators/parameters.

2.3.4 Alert and target levels serve as markers to define what is the abnormal/unacceptable occurrence rate, as well as the desired target (improvement) rate for the indicator. The alert level for a particular safety indicator is the demarcation line between the acceptable trending region and the unacceptable region. Target level setting is the desired improvement level within a defined future milestone or monitoring period. With such defined alert and target settings, it becomes apparent that a qualitative/quantitative performance outcome can be derived at the end of any given monitoring period. This may be done by counting the number of alert breaches and/or the number of targets achieved for an individual indicator and / or a package of safety indicators. Further guidance on setting alert and target levels can be found in the ICAO Safety Management Manual (SMM) (Doc 9859).

[3] For the restrictions on the use by CASA of an operator's safety information — see CASA Directive 02-0053, *Limitations on the Use of Safety Information*, as it exists from time to time. At the time of publishing this AC, the latest edition of the Directive had the effective date of August 2020.

2.3.5 Under such an assurance program, management would also be responsible for setting procedures to review new and existing aviation safety-related facilities and equipment, including operations and processes for hazards/risks before they are established or when changes to operations are introduced.

2.3.6 The FDA specific data output is recommended to be integrated into existing databases for measuring safety performance, managing change and continuous improvement. Such cross-communication between an FDAP and SMS would increase the robustness of the processes and help achieve greater effectiveness in safety and quality of the system/program.

2.3.7 Where an FDAP is in place but not integrated in the SMS, the operator will need to develop the processes to assure effective means of safety performance measurement and corrective action plans to maintain continuous improvement of the operations.

2.3.8 An FDAP held remote from an operator's SMS is likely to result in a substandard performance of the SMS for its continuous improvement. Moreover, information from other SMS data sources provides context to the flight data which will, in return, provide quantitative information to support analysis that otherwise would be based on subjective reports. Air safety reporting, avionic and systems maintenance, engine monitoring, ATC and scheduling are just a few of the areas that could benefit.

2.3.9 The degree of integration between an operator’s SMS and its FDAP will depend on many factors, including the relative maturity of the two systems as well as operational, organisational and regulatory considerations.

Note: Guidance on integration of management systems is provided in the ICAO Safety Management Manual (SMM) (Doc 9859), fourth edition.

3 Flight data analysis program description

3.1 FDAP overview

3.1.1 The quality and capability of an operator's FDAP will depend on the selection, availability of flight parameters, and the availability of the quick access recorder (QAR). The selected flight parameters should be relevant and appropriate to reflect the safety, quality or risk level of the process, thereby providing a performance track. It is important to note that the program description here provides baseline components. Therefore, depending on availability of resources, technology, complexity and size of operation, the program will need to be modified to suit the needs of the operator.

3.2 FDA equipment

3.2.1 FDAPs generally involve systems that capture flight data and then transform the data into an appropriate format for analysis, report generation and visualisations that assist in assessing the data. The level of sophistication of the equipment can vary widely. Typically, the following equipment capabilities are required for effective FDAPs:

- An on-board device to capture and record data on a wide range of flight parameters. These flight parameters should include, but not be limited to, the flight parameters recorded by the flight data recorder (FDR) or aircraft data recording systems (ADRS). The flight parameter performance (range, sampling rate, accuracy, recording resolution) should be as good as or better than the performance specified for FDR parameters.
- A means to transfer the data recorded on board the aircraft to a ground-based processing station. In the past, this largely involved the physical movement of the memory unit from the QAR. To reduce the physical effort required, more modern transfer methods utilise wireless technologies.
- A ground-based computer system (using specialised software) to analyse the data (from single flights and / or in an aggregated format), identify deviations from expected performance, generate reports to assist in interpreting the read-outs etc.
- Optional software for a flight animation capability to integrate all data, presenting it as a simulation of in-flight conditions, thereby facilitating visualisation of actual events for analysis and crew debriefing.

3.3 Airborne equipment

3.3.1 Modern glass-cockpit and fly-by-wire aircraft are equipped with the necessary digital data-buses from which information can be captured by a recording device for subsequent analysis. Older, non-digital, aircraft are capable of capturing a limited set of data, but may be retro-fitted to record additional parameters. Nevertheless, a limited parameter set will allow for a useful, basic FDAP.

3.3.2 The flight parameters recorded by the FDR or ADRS may determine a minimum set for an FDAP. In some cases, the flight parameters and FDR/ADRS recording duration

required by law to support accident and incident investigations may be insufficient to support a comprehensive FDAP. Thus, many operators are opting for additional recording capacity, capable of being easily downloaded for analysis.

3.3.3 QARs are optional non-crash protected recorders installed on the aircraft and record flight data in a low-cost removable medium. They are more accessible and record the same parameters for a longer duration than the FDR. New technology QARs and new flight data acquisition systems offer the possibility to capture and record thousands of flight parameters. They also allow for increasing the sampling rate or the recording resolution of specific flight parameters to values appropriate for advanced flight data analysis. The expanded data frame greatly increases the resolution and accuracy of the output from ground analysis programs. However, the data frame definition is one of the more difficult parts of setting up an FDAP. For example, in a mixed fleet, it can be very expensive to obtain the necessary capability to read different data sets.

3.3.4 An increasing number of aircraft are being fitted with light-weight flight recorders as standard equipment and these units can provide a source of flight data for operators of smaller aircraft. For operators not required by the civil aviation legislation to implement an FDAP, this could enable such operators to implement an FDAP commensurate with the size of their operations. The light-weight recorders make use of low-cost removable memory cards, which may simplify the process to download and analyse the flight data.

3.3.5 To eliminate the task of moving the data from the aircraft to the ground station by physically removing the recording medium of the QAR, newer systems automatically download the recorded information via secure wireless systems when the aircraft is in the vicinity of the gate. In other systems, the recorded data is analysed on board while the aircraft is airborne. The relevant encrypted data are then transmitted to a ground station using satellite communications. Fleet composition, route structure and cost considerations will determine the most cost-effective method of removing the data from the aircraft.

3.4 Ground-based computer system for flight data analysis

3.4.1 Flight data are downloaded from the aircraft recording device into a ground-based computer system including analysis software, where the data are held securely to protect this sensitive information. Such computer systems are commercially available; however, the computer platform will require appropriate front-end interfaces to cope with the variety of recording inputs available today.

3.4.2 FDAPs generate large amounts of data requiring specialised analysis software. This analysis software facilitates the routine analysis of flight data in order to identify situations that may require corrective action.

3.4.3 The analysis software checks the downloaded flight data for abnormalities. The exceedance detection typically includes a large number of trigger logic expressions derived from a variety of sources such as flight performance curves, SOPs, engine manufacturers' performance data, airfield layout and approach criteria. Trigger logic expressions may be simple exceedances such as redline values. The majority,

however, are composites which define a certain flight mode, aircraft configuration or payload-related condition. Analysis software can also assign different sets of rules depending on aerodrome or geography. For example, noise sensitive aerodromes may use higher than normal glide slopes on approach paths over-populated areas. The set of trigger logic expressions is normally user defined.

3.4.4 Exceedances and routine measurements can be displayed on a ground computer screen in a variety of formats. Recorded flight data are usually shown in the form of color-coded traces and associated engineering listings, cockpit simulations or animations of the external view of the aircraft.

4 Processing FDA data

4.1 Exceedance detection

4.1.1 Exceedance detection, such as deviations from flight manual limits or SOPs, is one way of extracting information from flight data. A set of core events/parameters establishes the main areas of interest to an operator.

4.1.2 Examples include: High lift-off rotation rate, stall warning, ground proximity warning system (GPWS) warning, flap limit speed exceedance, fast approach, high/low on glide slope and heavy landing.

4.1.3 Exceedance data provides factual information which complement crew and engineering reports.

4.1.4 Examples: Reduced flap landing, hard landings, emergency descent, engine failure, rejected take-off, go-around, airborne collision avoidance system (ACAS) or GPWS warning and system malfunctions.

4.1.5 Operators may also modify the standard set of core events to account for unique situations they regularly experience or for the SOPs they use.

4.2 Routine measurements

4.2.1 Data can be retained from all flights, not just those producing significant events. A selection of parameters is retained that is sufficient to characterise each flight and allow a comparative analysis of a wide range of operational variability. Emerging trends and tendencies are monitored before the trigger levels associated with exceedances are reached.

4.2.2 Examples of flight parameters monitored: Take-off weight; flap setting; temperature; rotation and lift-off speeds versus scheduled speeds; maximum pitch rate and attitude during rotation; and gear retraction speeds, heights and times.

4.2.3 Examples of comparative analyses: pitch rates from high versus low take-off weights; unstable approaches; and touchdowns on short versus long runways.

4.3 Incident investigation

4.3.1 FDAPs provide valuable information for incident investigations and for follow-up of other technical reports. Quantifiable recorded data have been useful in adding to the impressions and information recalled by the flight crew. FDAP data also provide an accurate indication of system status and performance, which may help in determining cause and effect relationships.

4.3.2 Examples of incidents where recorded flight data could be useful: High cockpit workload conditions as corroborated by such indicators as:

- late descent

- late localiser and / or glide slope interception
- large heading change below a specific height
- late landing configuration
- unstabilised and rushed approaches, glide path excursions etc.
- exceedances of prescribed operating limitations (such as flap limit speeds, engine over-temperatures)
- wake vortex encounters, low-level wind shear, turbulence encounters or other vertical accelerations.

4.4 Continuing airworthiness

4.4.1 Both routine measurements and exceedances can be utilised to assist the continuing airworthiness function. For example, engine-monitoring programs look at measures of engine performance to determine operating efficiency, predict impending failures and assist in maintenance scheduling.

4.4.2 Examples of continuing airworthiness uses: Engine thrust level and airframe drag measurements; avionics and other system performance monitoring; flight control performance; monitoring "on-condition" systems and engine deterioration; and brake and landing gear usage.

4.5 Integrated safety analysis

4.5.1 It is highly recommended that the data gathered in an FDAP be integrated in a central safety database. By linking an FDAP database to other safety databases (such as incident reporting systems and technical fault reporting systems), a more complete understanding of events becomes possible through cross-referencing the various sources of information. Care should be taken, however, to safeguard the confidentiality of FDA data when linking the data to identified data.

4.5.2 Example of integration: A heavy landing results in a flight crew report, an FDA exceedance and an engineering report. The flight crew report provides the context; the FDA exceedance provides the quantitative description; and the engineering report provides the result.

4.6 Analysis and follow-up

4.6.1 Overviews and summaries of FDA data are recommended to be compiled on a regular basis, usually weekly or bi-weekly, while individual significant events should be expected to be followed up in a timely fashion. All data should be reviewed to identify specific exceedances and emerging undesirable trends, and to disseminate the information to flight crews.

4.6.2 If deficiencies in flight technique are identified, the non-punitive nature of an FDAP means that the information should be de-identified to protect the identity of the flight crew. The information on specific exceedances is passed on to a flight crew contact person. This person provides the necessary contact with the flight crew (refer to Section

7.3 below) to clarify the circumstances, obtain feedback and provide advice and recommendations for appropriate action. These suggestions may include flight crew re-training (carried out in a positive and non-punitive way), revisions to operating and flight manuals, or changes to ATC and aerodrome operating procedures.

4.6.3 All events are archived in a database. The database is used to sort, validate and display the data in easy-to-understand management reports. Over time, this archived data can provide a picture of emerging trends and hazards which would otherwise go unnoticed.

4.6.4 Lessons learned from an FDAP may warrant inclusion in the company's safety promotion activities. Care is required, however, to ensure that any information acquired through FDA is de-identified before using it in any training or promotional initiative unless permission is given by all the crew members involved. To avoid an exceedance, care should also be taken so that flight crews do not attempt to fly the FDA profile rather than follow SOPs. Such a behaviour would have a negative impact on safety.

4.6.5 A proper value should be programmed for trigger and exceedance and designed to include an acceptable buffer that will disregard minor deviation, spurious events, as well as introduce an adequate operational margin to fly the aircraft through SOPs, instead of leading the flight crew to focus on FDA parameters to avoid deviations.

4.6.6 As in any closed-loop process, follow-up monitoring is required to assess the effectiveness of any corrective actions taken. Flight crew feedback is essential for the identification and resolution of safety problems and could include answering the following example questions:

- Is the implementation and effectiveness of corrective actions adequate?
- Are the risks mitigated, or unintentionally transferred to another part of the operations?
- Have new problems been introduced into the operation as a result of implementing corrective actions?

4.6.7 All successes and failures should be recorded, comparing planned program objectives with expected results. This provides a basis for review of an FDAP and the foundation for future program development.

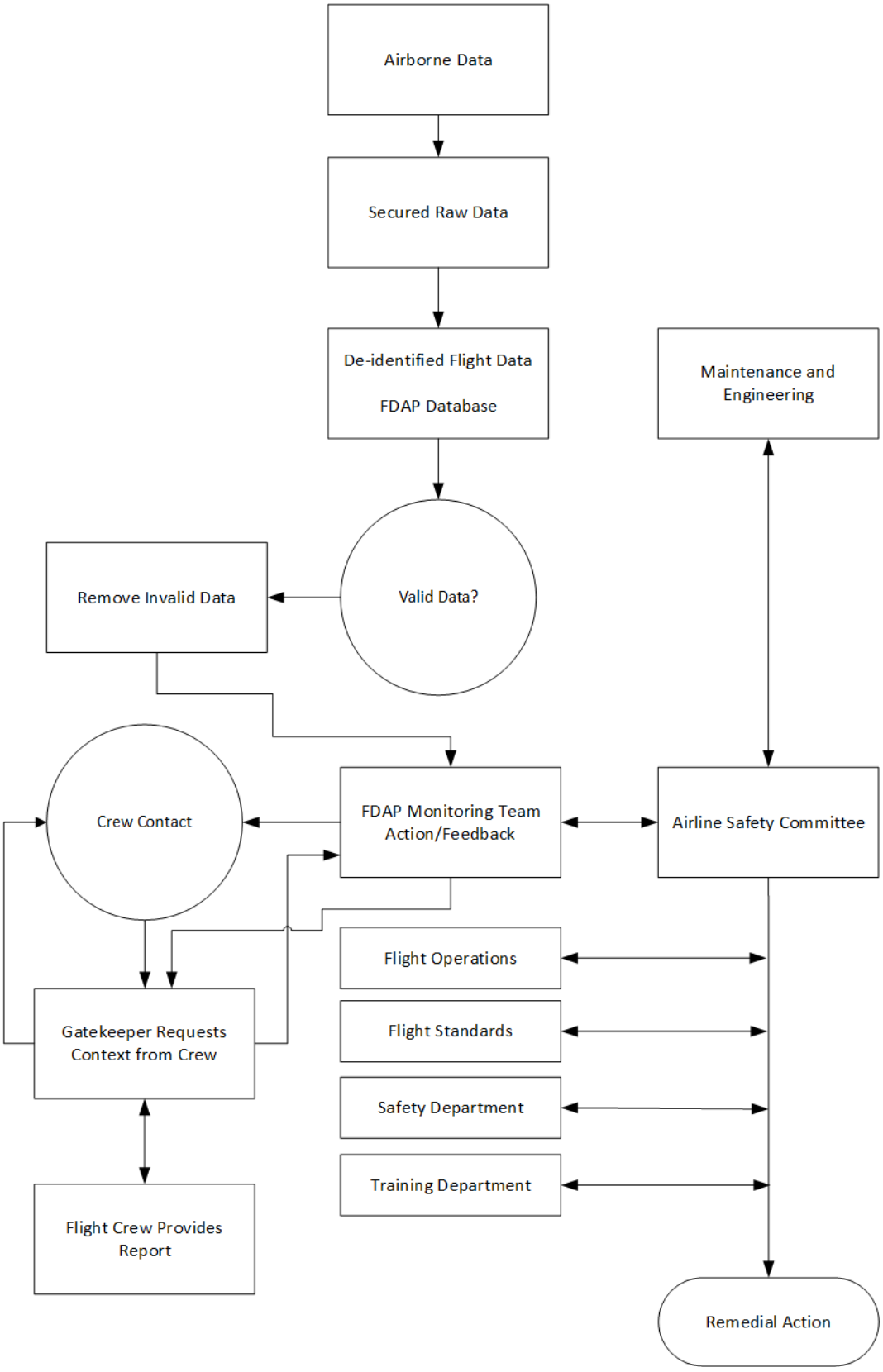

Figure 1: FDAP process flow

5 Prerequisites for an effective FDAP

5.1 Protection of FDA data

Overall approach

5.1.1 The civil aviation legislation[4] requires operator's that have an SMS due to a legislative requirement to protect safety information in accordance with principles of protection and exception that are aligned with ICAO Annex 19.

5.1.2 The requirements relating to the protection of safety information are designed to ensure that safety information is not used, except in tightly limited circumstances, for disciplinary or punitive purposes. The principles of protection do not prevent operators from using safety information for the purposes of taking preventive, corrective or remedial actions necessary to maintain or improve safety.

5.1.3 The integrity of an FDAP rests upon protection of the FDA data. Any disclosure for purposes other than safety management can compromise the required cooperation of the affected flight crew in clarifying and documenting an event. Thus, preventing the misuse of FDA data is a common interest of national authorities, operators and flight crews.

5.1.4 As with the flight crew contact person role, a designated person (could be the same person) to perform the function of determining, in accordance with procedures set out in the SMS, whether or not a principle of exception applies. This places an additional control on the ability to use the data for a purpose other than obtaining data.

5.1.5 In accordance with the operators SMS procedures, the principle of exception may apply if the:

- circumstances reasonably indicate the information came from an event where an act or omission constituting gross negligence, recklessness, or wilful and deliberate misconduct occurred
- safety information is part of a pattern of repetitive conduct, reflected in acts or omissions involving the same or substantially similar conduct by the same person over a relevant period of time.

Note: Refer to the relevant Australian legislative requirements in the footnote and ICAO Annex 19 Appendix 3.

5.2 Data protection

5.2.1 Data protection can be optimised by:

- adhering to the agreement between management and the flight crews, where available

[4] From 2 December 2021, directions related to the protection of safety information are contained, for Australian air transport operators, in section 19 of CASA EX82/21, and for aerial work operators, in section 22 of CASA EX86/21. Prior to 2 December 2021, requirements for the protection of safety information could be found in CAO 82.3 and CAO 82.5.

- strictly limiting data access to selected individuals
- maintaining tight control to ensure that data identifying a specific flight are kept secure
- ensuring that operational problems are promptly addressed by management
- to the extent possible, non-reversible de-identification of the flight data files after a time appropriate for their analysis.

5.3 Policy on retention of data

5.3.1 Because of the large volumes of data involved, it is important that a strategy for data access, both online and offline, is carefully developed to meet the needs of FDAP users. Additionally, records may need to be preserved at the advice and direction of the Australian Transport Safety Bureau (ATSB).

5.3.2 The most recent flight data and exceedances are normally kept readily available to allow fast access during the initial analysis and interpretation stages. When this process is completed, it is less likely that additional data from the flights will be required so the flight data can be archived. Exceedances are usually kept online for a much longer period to allow trending and comparison with previous events.

5.4 De-identification policy and procedures

5.4.1 A policy on FDA data de-identification is an absolutely critical area that should be carefully written out and agreed upon before it is needed in extreme circumstances. Management assurance on the non-disclosure of individuals must be expressly clear and binding. A principle of exception applies when the operator/flight crew believes that there is a continuing unacceptable safety risk if specific action regarding the flight crew is not taken. In this case, an identification and follow-up action procedure, previously agreed upon before the particular event, can be brought into play. Experience has shown that this is very rarely required. Most often, a flight crew responds to advice from the FDA flight crew contact person to submit an aviation safety report, and they may then be covered by protection assured under that program.

5.4.2 There should be an initial stage during which the data can be identified to allow confidential follow-up by the crew representative or trusted individual agreed upon by the operator and the flight crews. Strict rules of access should be enforced during this period. In the case of a mandatory occurrence or accident, any data retained by the program may not be de-identified or removed from the system prior to the investigation or for confirmation that it is not required. This will allow the safety investigators access to all relevant information.

5.5 Set authorised access levels

5.5.1 The FDA ground-based computer system must have the ability to restrict access to sensitive data and also control the ability to edit data. For example, the FDA flight crew contact person could have full access, while operations management would only have

access to de-identified data and the ability to add comments and edit a few appropriate fields.

5.6 Involvement of flight crews

5.6.1 As with successful incident reporting systems, the trust established between management and its flight crews is the foundation for a successful FDAP. For most operators, this will be accomplished through an industry association. Here, it is incumbent upon management to provide assurance of the FDAP intent, conditions of use and protection given to its employees. This trust can be facilitated by:

- early participation of the flight crew representatives and/or authority representatives in the design, implementation and operation of an FDAP
- a formal agreement between management and the flight crews, and/or authority identifying the procedures for the use and protection of data.

5.7 Safety culture

5.7.1 Consistent and competent program management characterises successful FDAPs. Indications of an effective safety culture of an operator include:

- senior management's demonstrated commitment to promoting a proactive safety culture
- the cooperation and accountability of all organizational levels and relevant personnel representatives, meaning that anyone believing to have identified a potential risk should feel able to report and expect follow-up action to be considered. From the line pilot to the fleet manager, all have responsibility to act
- a written non-punitive company policy that covers FDA and makes it clear that the main objective of an FDAP should be to improve safety, and not to allocate blame or liability (note there are requirements in the civil aviation legislation related to this topic)
- an identified safety manager whose role and functions are defined following the recommendations of regulation 119.160
- FDAP management by a dedicated staff member under the authority of the safety manager, with a high degree of specialisation and logistical support
- involvement of persons with appropriate expertise when identifying and assessing risks. For example, flight crews experienced on the aircraft type being analysed are required for the accurate diagnosis of operational hazards emerging from FDA analyses
- a focus on monitoring fleet trends aggregated from numerous operations, rather than on specific events. The identification of systemic issues adds more value for safety management than isolated events
- a well-structured de-identification system to protect the confidentiality of the data
- an efficient communication system to permit timely safety action for disseminating hazard information and subsequent risk assessments internally and to other organisations.

6 Establishing and implementing an FDAP

6.1 Implementation plan

6.1.1 Typically, the following steps are required to implement an FDAP:

- management approval of the program
- implementation of a formal agreement between management and flight crews
- identification of an FDAP implementation committee, including the future FDA team members; this committee should be involved in all of the following steps
- development of a business plan, including processes, software and hardware and assignment of adequate resources
- establishment and verification of operational and security procedures
- development of an FDAP procedures manual
- assessment of possible interfaces between an FDAP and other safety data sources (i.e., SDCPS) and of integration of an FDAP into the SMS
- selection of equipment (airborne, ground-based computer system, interface with other data sources and the SMS)
- selection and training of the FDA team members, according to their respective roles
- testing of data transfer; testing of the ground-based computer system (including data acquisition, definition of trigger logic expressions, data analysis and visualisation, data de-identification, final storage of data)
- testing of data security, including security procedures
- identification of areas of interest that should be a priority in the data analysis
- checking of the proper decoding and of the quality of flight parameters used by an FDAP
- start of data analysis and validation, focused on key areas in operation.

Note: FAA Advisory Circular 120-82 provides an example of an FDAP implementation plan.

6.1.2 Historically, bearing in mind the time required to obtain flight crew / management agreements and develop relevant procedures, an operator with no FDA experience would not likely achieve an operational FDAP in less than twelve months. Another year may be required before any safety and cost benefits appear. Improvements in the analysis software, or the use of outside specialist service providers, could shorten these time frames to ensure FDA coverage during the safety-critical period of introduction to service.

6.2 Aims and objectives

6.2.1 A phased approach is recommended so that the foundations are in place for possible subsequent expansion into other areas. Using a building block approach will allow expansion, diversification and evolution through experience.

6.2.2 Example: With a modular system, begin by looking at basic safety-related issues only. Add engine health monitoring etc. in the second phase. Ensure compatibility with other systems.

6.2.3 A staged set of objectives starting from the first week's replay and moving through early production reports into regular routine analysis will contribute to a sense of achievement as milestones are met.

6.2.4 Examples:

- Short-term goals:
  - establish data download procedures, test analysis software and identify aircraft defects
  - validate and investigate exceedance data
  - establish a user-acceptable routine report format to highlight individual exceedances and facilitate the acquisition of relevant statistics.
- Medium-term goals:
  - produce annual report – include key performance indicators
  - add other modules to analysis (e.g., continuing airworthiness)
  - plan for the next fleet to be added to the program.
- Long-term goals:
  - network FDA information across all company safety information systems and integrate an FDAP into the SMS
  - ensure FDA provision for any proposed advanced training program
  - use utilisation and condition monitoring to reduce spares holdings.

6.2.5 Initially focusing on a few known areas of interest will help prove the system's effectiveness.

6.2.6 Examples: Rushed approaches, or rough runways at particular aerodromes; unusual fuel usage on particular flight segments etc. Analysis of such known problem areas may generate useful operational confidence leading to the analysis of other areas.

6.3 The FDAP team

6.3.1 Experience has shown that the team required to run an FDAP can vary in size from one person for a small fleet, to a dedicated section for large fleets. The discrete functions detailed below are used globally and align with ICAO guidance. Australian air transport operators required to have an FDAP should note that only certain persons are permitted by the civil aviation legislation to have access to the identity of a person who reported the flight data, or who is the source or subject of the flight data[5]. The descriptions identify various functions to be fulfilled, not all of which need a dedicated position:

[5] Subregulation 119.195(3) outlines persons who may have access to the identity of persons that reported, or are the source or subject of, operational flight data. This regulation predated amendments made to CAOs 82.3 and 82.5 to align with the latest ICAO Annex 19 standards regarding principles of protection and exception. As a result, an exemption has been issued to align the practical outcomes of regulation 119.195 with the CAO amendments (due to the CAOs being repealed on 1 December 2021) until the regulation can be amended. This exemption is contained in section 18 of CASA EX82/21.

- **Team leader** – It is essential that the team leader earn the trust and full support of both management and flight crews. They act independently of others in line management to make recommendations that will be seen by all to have a high level of integrity and impartiality. The individual requires good analytical, presentation and management skills. They should be the safety manager or placed under the authority of the safety manager.
- **Flight operations interpreter** – This person is usually an experienced pilot in the type and operation who knows the operator's route network and aircraft. This team member's in-depth knowledge of SOPs, aircraft handling characteristics, airports and routes will be used to place the FDA data in a credible context.
- **Technical interpreter** – This person interprets FDA data with respect to the technical aspects of the aircraft operation and is familiar with the power plant, requirements of structures and systems departments for information, and any other engineering monitoring programs in use by the operator.
- **Flight crew contact person** – This is a person usually assigned by the operator for this responsibility (safety manager, agreed flight crew representative, honest broker), or a mutually acceptable substitute, for confidential discussion with flight crews involved in events highlighted by FDA. The position requires good people skills and a positive attitude towards safety education. The flight crew contact person should be the only person permitted to connect the identifying data with the event (note that there are specific requirements in the civil aviation legislation in relation to the persons permitted to identify specific persons as the source of, or the subject of, safety information). The flight crew contact person requires the trust of both flight crew members and managers for his/her integrity and good judgement.
- **Engineering technical support** – This person is usually an avionics specialist, involved in the supervision of FDR serviceability. Indeed, an FDAP can be used to monitor the quality of flight parameters sent both to the FDR and to the FDA recorder, and thus ensure the continued serviceability of the FDR. This team member should be knowledgeable about FDA and the associated systems needed to run the program.
- **Air safety coordinator** – This person cross-references FDA information with other safety data sources (such as the company's mandatory or confidential incident reporting program and LOSA) and with the operator's SMS, creating a credible integrated context for all information. This function can reduce duplication of follow-up investigations.
- **Replay operative and administrator** – This person is responsible for the day-to-day running of the system, producing reports and analyses. Methodical, with some knowledge of the general operating environment, this person keeps the program moving. Operators may utilise the services of a specialist contractor to operate an FDAP.

6.3.2 All FDAP team members need appropriate training or experience for their respective area of data analysis and should be subject to a confidentiality agreement.

6.3.3 Each team member should be allocated a realistic amount of time to regularly spend on FDA tasks. With insufficient human resources, the entire program will underperform or even fail.

6.4 Continuous improvement

6.4.1 New safety issues identified and published by other organisations, such as safety investigation reports, safety bulletins by the aircraft manufacturer or safety issues identified by aviation authorities, should be assessed for inclusion in a corresponding monitoring activity of an FDAP.

6.4.2 The FDA processes and procedures will need to be amended when an FDAP matures. Each time there are changes in either the operations or the internal organisation of the aircraft operator, as well as the interface with other data sources and processes, a review should be conducted.

6.4.3 To assess the general effectiveness of an FDAP, a periodic review or an audit may be beneficial.

6.4.4 Such a review could determine whether:

- anticipated safety benefits are being realised
- the FDA procedures reflect the actual operation of an FDAP, and whether they have been followed
- the information provided to FDAP users is accurate, timely, and useable
- the tools employed to collect and present data are still adequate and whether other technology would be more effective.