ORG

RIYADH AIR
طيران الرياض

FLIGHT DATA ANALYSIS PROGRAM

Department

ORGANIZATION

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0 FRONT MATTER

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0.2 REVISION HIGHLIGHTS

This table summarizes the major changes made to each revision, not all changes. Throughout each review cycle, subsequent entries may change prior entries or proposed changes may be held, disregarded, and/or obsolete. This is a summary of input received throughout the duration. Changes throughout the manual are indicated by vertical revision bars.

Note: *The vertical bar (change bar) in the margin indicates a change, addition, or deletion in the adjacent text for the current revision of that page only.*

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0.8 LIST OF COMPLIANCE ENTRIES

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		IOSA	FLT 1.7.4
0.13.3	DISTRIBUTION LIST AND AVAILABILITY	GACAR	121.151, 121.155
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0.9 MANAGEMENT APPROVAL

Manual Number:	**RXI/OPS-ORG-M08**
Title:	**FLIGHT DATA ANALYSIS PROGRAM**
Issue:	00
Revision:	00

Recommended by:		Date:
Title:		
Signature:		

Quality Review by:		Date:
Title:		
Signature:		

Approved by:		Date:
Title:		
Signature:		

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0.10 GACA ACCEPTANCE

This manual is a controlled document, prepared to meet the requirements of the General Authority of Civil Aviation Regulations (GACAR) and is herewith accepted/approved by the General Authority of Civil Aviation (GACA) exclusively for the use of Riyadh Air.

If any conflict exists between the contents of this manual and GACA requirements, GACA requirements shall take precedence, and the manual will be revised without delay in accordance with GACA eBook Vol.4 Ch.12, section 4.

All contents of this manual are current, as listed in the List of Effective Pages (LEP) Revision 0. 18 Feb 2024.

This manual becomes 'uncontrolled' when printed.

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0.11 INTRODUCTION

0.11.1 Policy

The Flight Data Analysis Program (FDAP) sometimes referred to as Flight Data Monitoring (FDM) or Flight Operational Quality Assurance (FOQA) is a systematic tool for proactive identification of hazards. It involves the process of analyzing recorded flight data in order to improve the safety of Aircraft operations and compliments the Riyadh Air Safety Risk Management and incident investigation program of Riyadh Air. The FDM is a proactive and non-punitive program using routine collection and analysis of flight data to develop objective and predictive information for advancing safety, e.g. through improvements in flight crew performance, training effectiveness, operational procedures, maintenance, and engineering procedures.

This FDAP has been developed and issued by the Riyadh Air Safety Department, FDAP Cell. The manual is specifically oriented and focused to define the Flight Data Analysis Program of Riyadh Air.

The Manual provides guidance to Riyadh Air Safety personnel involved in the establishment and functioning of FDAP. This manual is developed under the authority of Vice President Corporate Safety, Security, Quality and Environment (VPCSSQE) and has been prepared as per the requirements laid down in GACAR Part 05 and e-book Volume 2 ICAO Document 9859/10000.

0.11.2 Applicability

FDAP serves as an essential guide for all operational personnel in the organization, and it is incumbent upon every employee, regardless of their role, to adhere to the policies, procedures, regulations, guidance, and instructions detailed within this manual.

0.11.3 Common Language

Refer to Corporate Policy Manual, Section 0.11.1.

0.11.4 Usage Of Terms

Refer to Corporate Policy Manual Section 0.11.2.

0.11.5 Human Factor Principles

Refer to Corporate Policy Manual Section 0.11.5.

0.11.6 Applicable Regulations and Standards

Throughout this manual, compliance tags are used to help users easily locate and reference applicable regulations, rules, standards, and recommended practices. These tags are a systematic and organized

way to manage and ensure adherence to regulatory requirements, company policies and industry standards.

This allows Riyadh Air to ensure that all regulatory standards imposed by the GACA and other aviation authorities are explicitly covered. Where an applicable regulation, rule or standard exists, the relevant section of the Operations Manual includes a header bar listing the applicable regulation and/or standard (example below).

Example Header:

GACAR § 121.123

The following regulations and standards addressed in this manual, include:

1. GACA Regulations:
    a. PART 4 - Occurrence Reporting And Safety Information System
    b. PART 5 - Safety Management Systems
2. IATA Standards Manual, applicable edition.
3. Aviation Investigation Bureau Regulations (AIBR).

0.12 ABBREVIATIONS, ACRONYMS AND DEFINITIONS

0.12.1 Abbreviations And Acronyms

C	
CFIT	Controlled Flight into Terrain
CVR	Cockpit Voice Recorder
D	
DFDR	Digital Flight Data Recorder
DMS	Document Management System
DOS	Director of Safety
DP	Distributed Processing
E	
EMS	Event Measurement System
F	
FDA	Flight Data Analysis
FDAP	Flight Data Analysis Program
FDAU	Flight Data Acquisition Unit
FDIMU	Flight Data Interface Management Unit
FDM	Flight Data Monitoring
FDW	Flight Data Warehouse
FOQA	Flight Operations Quality Assurance
FSDS	Flight Safety Documentation System
G	
GACA	General Authority of Civil Aviation
GACAR	General Authority of Civil Aviation Regulations
O	
ODW	Operational Data Warehouse
L	
LOC-I	Loss of Control In-Flight

M	
MAC	Mid-Air Collision
P	
PCMCIA	Personal Computer Memory Card International Association
Q	
QAR	Quick Access Recorder
R	
RE	Runway Excursion
RXI	Riyadh Air
S	
SDCPS	Safety Data Collection and Processing System
SMS	Safety Management System
SOP	Standard Operating Procedure
SPI	Safety Performance Indicator
U	
URA	Universal Resolver Architecture
W	
WASABI	Wide Area Store-and-forward Aviation Binary Interchange

0.12.2 Definitions

A	
Aggregate Data.	The summary statistical indices that are associated with FOQA event categories, based on an analysis of FOQA data from multiple aircraft operations.
Aggregation.	The process that groups and mathematically combines individual data elements based on some criterion (e.g., time, geographical location, event level, aircraft type). Each aggregation is based on factors of interest to the analyst at a particular point in time.
D	
Data Validation.	A process during which flight data are reviewed to see that they were not generated as a result of erroneous recording or damaged sensors.

De-identified Data.	Data from which any identifying elements that could be used to associate them with a particular flight, date, or flight crew has been removed
E	
Event.	An occurrence or condition in which predetermined values of aircraft parameters are measured. Events represent the conditions to be tracked and monitored during various phases of flight and are based on the sensory data parameters available on a specific aircraft fleet.
Event Category.	Event categories are areas of operational interests (e.g. aircraft type, phase of flight, geographical location) on which FOQA event monitoring and trend analysis is based.
Event Levels.	The parameter limits classify the degree of deviation from the established norm into two or more event severity categories. When assigning levels to an event, consideration is given to compliance with federal regulations, aircraft limitations and company policies and procedures.
Event Validation.	The process in which an event is determined to be a valid sample of operation outside the established norm. Even though aircraft parameter limits may have been exceeded, a valid event may not have occurred (e.g. significant localizer deviation may have occurred when an aircraft was making a sidestep approach to a parallel runway).
F	
Flight Data Acquisition Unit (FDAU).	A device that acquires aircraft data via a digital data bus and analog inputs and that formats the information for output to the flight data recorder in accordance with requirements of regulatory agencies. In addition to the mandatory functions, many FDAUs have a second processor and memory module that enables them to perform additional Aircraft Condition Monitoring System (ACMS) functions/reports. The FDAU can provide data and predefined reports to the cockpit printer, directly to Aircraft Communications Addressing and Reporting System (ACARS) for transmittal to the ground, or to a Quick Access Recorder (QAR) for recording/storage of raw flight data. The FDAU can also display data for the flight crew
Flight Data Recorder (FDR).	A required device that records pertinent parameters and technical information about a flight. At a minimum, it records those parameters required by the governing regulatory agency but may record a much higher number of parameters. An FDR is designed to withstand the forces of a crash so that information recorded by it may be used to reconstruct the circumstances leading up to the accident.

Flight Operational Quality Assurance (FOQA).	A voluntary program for the routine collection and analysis of flight operational data to provide more information and greater insight into the total flight operations environment. A FOQA program combines this data with other sources and operational experience to develop objective information to enhance safety, training effectiveness, operational procedures, maintenance, engineering procedures and air traffic control (ATC) procedures. Ground Data Replay and Analysis System (GDRAS). A software application designed to: 1. Transform airborne-recorded data into a usable form for analysis. 2. Process and scan selected flight data parameters. 3. Compare recorded or calculated values to predetermined norms using event algorithms. 4. Generate reports for review.
P	
Parameters.	Measurable variables that supply information about the status of an aircraft system or subsystem, position, or operating environment. Parameters are collected by a data acquisition unit installed on the aircraft and then sent to analysis and reporting systems.
Phase of Flight.	The standard high-level set of activities performed by pilots on all operational flights (i.e., preflight, engine start, pushback, taxi, takeoff, climb, cruise, descent, holding, approach, landing, taxi and postflight operations).
Q	
Quick Access Recorder (QAR).	A recording unit onboard the aircraft that stores flight recorded data. These units are designed to provide quick and easy access to a removable medium on which flight information is recorded. QARs may also store data in solid-state memory that is accessed through a download reader. QARs have now been developed to record an expanded data frame, sometimes supporting over 2,000 parameters at much higher sample rates than FDR. The expanded data frame greatly increases the resolution and accuracy of the ground analysis programs.
S	
Stakeholder.	Constituencies that are potential users of FOQA data and that have a stake in the program's success.

0.13 SYSTEM OF AMENDMENT AND REVISION

0.13.1 Manual Ownership

The Vice President Corporate Safety, Security, Quality and Environment (VPCSSQE) is responsible for overseeing Flight Data Analysis Program (FDAP) and serves as the Manual Owner. All revisions to the manual undergo a structured approval process.

The VPCSSQE has the final authority to approve amendments to FDAP. This emphasizes the manual owner's significance in ensuring document accuracy and compliance. Any amendments that require GACA approval or acceptance are submitted for review before they are published.

To ensure efficient dissemination of information, all approved amendments are shared electronically with manual holders. This aligns with Riyadh Air's commitment to transparent and accessible communication of operational updates.

This systematic approach reflects Riyadh Air's dedication to upholding rigorous standards in operational documentation.

0.13.2 Manual Holder Responsibility

No relevant personnel within the operational framework may perform their duties without access to a current copy of the FDAP. This policy highlights the importance of real-time information in creating a safe and efficient operational environment. Regular manual updates not only help conform to regulations but also enhance the overall effectiveness of our personnel in carrying out their responsibilities with precision and in accordance with industry best practices.

Note: *Uncontrolled copies of this Manual shall not be used.*

0.13.3 Distribution List and Availability

GACAR § 121.151 / § 121.155

At Riyadh Air, all operational personnel are provided with an updated electronic copy of this manual along with other relevant manuals. Subsequent updates are also given to the appropriate personnel, including but not limited to ground operations staff, maintenance staff, crew members, and assigned GACA representatives.

It is mandatory for the recipients of these manuals to keep them up to date with the provided changes and additions.

0.13.4 Publication Hierarchy

IOSA ORG 2.5.3

Refer to Corporate Policy Manual Section 0.13.4.

0.13.5 Manual Structure

The Emergency Response Manual is divided into 8 chapters and Appendices, as shown below:

0 FRONT MATTER

1 FLIGHT DATA ANALYSIS PROGRAM OVERVIEW

2 DATA PROTECTION AND LEGAL AGREEMENTS

3 ORGANIZATION STRUCTURE

4 FDAP DATA ANALYSIS

5 CREW CONTACT / COUNSELING

6 ACTING ON RESULTS AND FOLLOW-UP

7 PROTECTION AND RETENTION OF FDAP DATA

8 SERVICEABILITY AND THE FDM SYSTEM

9 CONTINUOUS IMPROVEMENT

10 APPENDIX

0.13.6 Source of Amendments

Refer to Corporate Policy Manual, Section 0.13.6.

0.13.7 Referenced and Linked Documents

FDAP is interconnected with the following Regulations and Manuals. When changes are made to any of the below Regulations or Manuals, Riyadh Air undertakes a review of the relevant changes for incorporation into ERM.

1. GACAR - Safety Regulations.
2. CPM - Corporate Policy Manual.
3. Corporate Safety Management Manual (CSMM).

0.13.8 Format and Documentation Control Requirements

IOSA ORG 2.5.1 / ORG 2.5.3

Refer to Corporate Policy Manual, Section 0.13.8.

0.13.9 Error Reporting and Corrections and Suggestions for Improvement

All personnel are responsible for maintaining the accuracy and integrity of Riyadh Air's operations. If an employee comes across an error, notices any incorrect information in this manual or has a suggestion, they should report it to the Safety office. They will acknowledge receipt of the information and provide feedback to the concerned employee on their suggestion, the action taken to fix the error or update the information.

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1 FLIGHT DATA ANALYSIS PROGRAM OVERVIEW

1.1 INTRODUCTION

Flight Data Analysis Program (FDAP) provides a systematic tool for proactive identification of hazards in aircraft operations before they may result in an accident, serious incidents, and incidents. It complements hazards identification and mandatory safety reporting system.

FDAP is a non-punitive program for routine collection and analysis of flight data to develop objective and predictive information for advancing safety, e.g. through improvements in flight crew performance, training effectiveness and operational and engineering procedures.

The Safety Office of Riyadh Air will ensure effective functioning of the program in coordination with the operations, training, and other concerned Divisions.

Flight Data Analysis Program involves processing QAR/DFDR data through GE Aerospace Safety Insight software and running through filters for aircraft type. This program is based on collection and analysis of the QAR/DFDR and CVR data, which enables the Airlines to improve:

1. Safety of Aircraft Operations.
2. Flight Crew Performance.
3. Operations Training Program and procedures.
4. Adherence to Air Traffic Control (ATC) procedures.
5. Aircraft Maintenance.
6. Reduction in incidents and consequent reduction in cost.
7. Additional data available for timely troubleshooting.
8. Fewer unscheduled component changes.
9. Better preventive maintenance.
10. Reduced requirements for spare part inventories.

1.1.1 Flight Data Analysis Program

The FDA Program enhances the cooperation between Safety Department and other operational departments including the Flight Operations and Engineering, thus promoting mutual trust towards the improvement of safety.

Those involved in this Program have to explore new or other possibilities, keeping in mind that the FDA Program is a safety program and it is proactive and non-punitive. This FDA Program allows Riyadh Air Safety Department to validate the adherence to the standard operating procedures with the actual daily flights flown. The FDA program allows the safety departments to:

1. Identify areas of operational risk and quantify current safety margins.

   This system helps to identify the deviations from the company procedures, the precursor risks in operations and in measuring current safety margins for effectiveness. For this program an operational baseline has been established and fed into the GE software, from which we detect and measure any deviations and is enclosed with this document.

2. Identify and quantify operational risks by highlighting when non-standard, unusual, or unsafe circumstances occur.

   The system enables us to highlight operational risks based on the deviations from SOPs, unconventional and unsafe conditions detected during the flight data analysis.

3. Use the FDAP information on the frequency of occurrence, combined with an estimation of the level of severity, to assess the safety risks and to determine which may become unacceptable if the discovered trend continues.

   The information generated from the system provides an oversight of our overall flight operations. The system also determines if an individual or fleet risk is within an acceptable level and is able to identify whether a trend towards unacceptable risk is present. The trend analysis of the FDAP events identifies the significant risk areas.

4. Put in place appropriate procedures for remedial action once an unacceptable risk, either present or predicted by trending, has been identified.

   Through this Program, a set of remedial actions that would be appropriate to an unacceptable risk, which is either present or predicted through trend analysis. Keeping in mind, the risk will not simply be transferred elsewhere in the system.

5. Confirm the effectiveness of any remedial action by continued monitoring.

   The effectiveness of the remedial actions taken are closely monitored to ensure that the actions taken were appropriate, that it has reduced the risk at same time the hazard was not transferred.

6. The Program also demonstrates a feedback loop. As part of the SMS process, this loop allows the timely implementation of corrective actions on the Hazards identified and where safety may have been compromised by significant deviations from the standard operating procedures.

1.2 FDM PROGRAM STAKEHOLDERS

1. **Riyadh Air:** Airline is the primary stakeholder for the FDA Program and uses data monitoring to enhance safety and improve operational efficiency and monitor compliance.
2. **Post Holder Safety:** Uses FDAP data to identify safety risks, trends, and potential areas for improvement.
3. **Flight Operations:** Uses the FDAP data to access the overall performance of the aircraft and its systems. It can use data to enhance operational performance, training program and operational procedures.
4. **Crew Members:** Crew members play a crucial role in ensuring safe operations of aircraft and use the FDA Program to improve their skills and decision making.
5. **Maintenance and Engineering Department**: Uses the FDAP data to identify trends and issues that may require maintenance actions.
6. **Regulators:** Aviation regulators use the FDAP program to assess the compliance with laid down regulations.
7. **Aircraft Manufacturer:** Uses FDAP data to monitor the performance of aircraft and to identify any issue that may support maintenance of aircraft.
8. **Insurance Company:** Insurance companies may use FDAP data to assess an airline's safety record and determine insurance premiums.

1.3 OBJECTIVES

The objective of the Flight Data Analysis Program (FDAP) is accident prevention by observing and analyzing operational trends in Riyadh Air flight operations, to recommend accident prevention measures. FDAP program aims at continuous improvement of the overall safety performance, and it is integrated in the safety assurance component of Riyadh Air.

As a part of SMS's safety assurance processes, Riyadh Air has identified Safety Performance Indicators or parameters chosen for measuring and monitoring the Operations Safety Performance including "operational events.".

The Main Objectives for FDAP Program are:

1. Monitoring of the flight data to determine the exceedances in flight parameters from the stipulated limit and analysis of the detected exceedances.
2. Identify areas of operational risk and quantify current safety margins.
3. Identify trends.
4. Provide actual rather than presumed performance measurement for risk management purposes.
5. Identify and quantify changing operational risks by highlighting when non-standard, unusual, or unsafe circumstances occur.
6. To use the FDAP information on the frequency of occurrence, combined with an estimation of the level of severity, to assess the risks and to determine which may become unacceptable if the discovered trend continues.
7. To put in place appropriate risk mitigation techniques to provide remedial action once an unacceptable risk, either present or predicted by trending, has been identified.
8. Confirm the effectiveness of any remedial action by continued Analysis.
9. Analysis of the systemic aspects of an incident by comparing the flight data of the related flight with the fleet profile data, thereby facilitating the actual root cause.
10. Engine monitoring programs may utilize the 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 other systems.

1.4 FDAP AND THE SMS

Safety management system is a data driven system which identifies any potential risk within the system of the organization. Flight Data Analysis Program data provides valuable data to the SMS system within the organization about actual safety related events and trends.

Outcomes from the flight data monitoring system are fed within the Riyadh Air SMS database and form the primary basis for the Safety Performance Indicators of the Operations of aircraft.

This Program complements our positive safety culture. Everyone is willing to raise potential risks within the organization in such a way that remedial actions are taken in a non-punitive way, however if anyone involves in cases of possible gross negligence will receive fair treatment and proportionate remedial action to prevent a reoccurrence. This is as per Riyadh Air just culture policy. This policy is an important part of Riyadh Air safety culture.

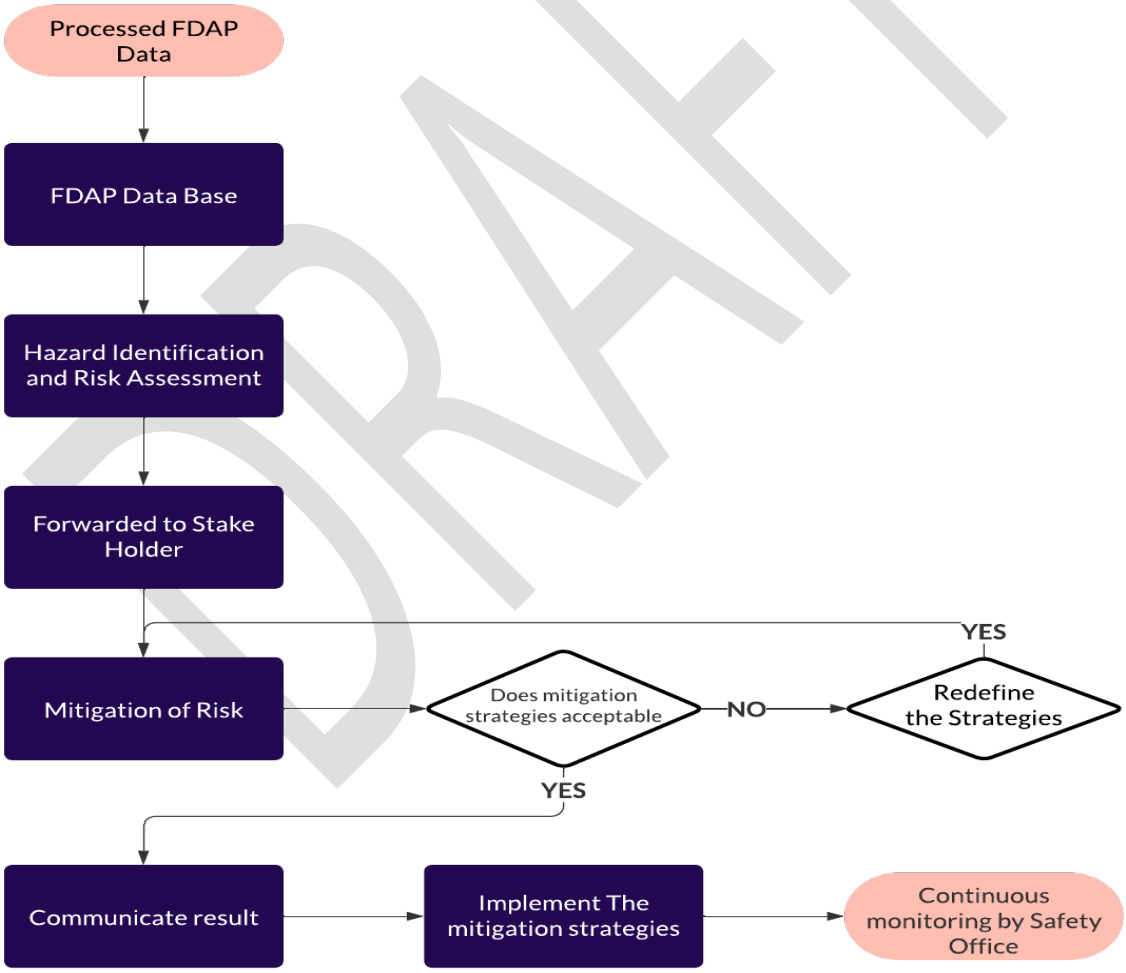

Figure 1 FDAP Process in SMS

1.4.1 RISK MANAGEMENT

The process starts with the identification of hazards and their potential consequences. The safety risks are then assessed against the threat of potential damage related to the hazard. These risks are weighted in terms of probability and severity. If the assessed safety risks are deemed not to be tolerable, appropriate corrective action is taken.

1.4.1.1 Identify Hazards

FDAP provides a powerful tool for proactive hazard identification. Limitation of FDAP data is that it only tells what happened and needs the situational context to understand why an event happened. The FDAP data gives quantitative information to support other subjective reports to identify system weaknesses and deficiencies.

1.4.1.2 Risk Management

Initial Risk Assessment: FDAP provides information and measures to support expert opinion and experiences that form a baseline against which future changes and risks are measured.

1.4.1.3 Reinforce Defenses

Based on the existing identified hazards, risk assessment is performed and informed decisions are taken whether to strengthen defenses and monitor the existing defenses. Trigger levels are established, and actions are taken to reduce the probability of occurrence.

1.4.1.4 Safety Assurance

FDAP gives information of actual operations and acts as a tool for continuous monitoring for safety assurance.

1.4.2 ASSURANCE

FDAP Data is a good source to identify any potential threats to operations and emerging trends within Riyadh Air's operations. It helps identify the area for improvement, prevent safety incidents and continuously enhance the safety culture within the airline.

This is achieved via:

1. **Compliance with the regulation:** FDAP provides a good means to monitor established standards and procedures. This proactive approach enables the identification and correction of any deviations promoting adherence to regulatory requirements.
2. **Performance Monitoring:** FDAP provides a systematic way to monitor the performance of flight operations. By analyzing flight data, the organization assesses the effectiveness of operational procedures, adherence to standard operating practices, and the overall performance of both aircraft and flight crews.
3. **Auditing and reviewing:** Regular auditing and reviewing of FDAP data allows Riyadh Air to conduct thorough assessments of safety-critical events and operational practices. Audits can identify trends, patterns, and areas for improvement, helping the organization to maintain a high level of safety standards.
4. **Continuous improvement:** FDAP data is a key tool in fostering a culture of continuous improvement within the organization. By analyzing data trends and safety events, Riyadh Air implements targeted measures to enhance operational procedures, provide additional training and make informed decisions for continuous safety enhancements.
5. **Communication to the various stakeholders:** Communication of FDAP findings and safety-related information to various stakeholders is essential. This includes sharing insights with flight crews, maintenance personnel, regulators, and other relevant parties. Transparent communication promotes a shared understanding of safety goals and fosters collaboration in maintaining a strong safety culture.

1.4.3 FDAP INTERNAL AUDITS

As a part of Riyadh Air Corporate Quality Management System, a periodic review of FDAP will be conducted to check its effectiveness and compliance with the applicable regulations and industry best practices.

VPSSE will be in-charge of FDAP team and is accountable for maintaining the FDAP as per regulations.

1.4.4 MANAGING EXTERNAL AUDITS

The Director of Safety takes a leadership role in leading the FDAP team during external regulatory and other audits. The Director of Safety is accountable for maintaining the FDAP in accordance with applicable regulations and standards. In the event of any observations or findings during an external audit, the Director of Safety takes the lead in providing responses and addressing concerns raised by auditors. The Director of Safety extends assistance to corporate quality auditors during external audits, ensuring a collaborative and comprehensive approach to the audit process.

The Flight Data Specialist is designated as the person responsible for the Flight Data Analysis (FDA) Program. During external audits, the Flight Data Specialist takes an active role in assisting external auditors, providing insights into FDAP processes, and facilitating a thorough understanding of the program and leverages expertise in FDAP processes to address specific queries or concerns raised by external auditors, ensuring clarity and accuracy in responses.

There is a collaborative effort between the Director of Safety and the Flight Data Specialist to ensure a seamless audit process. Any observation or finding arising during an external audit is comprehensively addressed by the Director of Safety and the Flight Data Specialist plays a pivotal role in providing detailed and accurate information.

1.4.5 STRATEGIC REVIEW AND CONTINUAL IMPROVEMENT

Internal audits, conducted by Riyadh Air's own auditing processes, provide an opportunity for self-assessment and identification of areas for improvement within the FDAP. External audits, carried out by regulatory bodies or independent auditors, bring an external perspective and objective evaluation of the FDA program's adherence to industry standards and regulations.

Observations made during audits highlight specific gaps, weaknesses or areas that may benefit from enhancement within the FDA program. A thorough analysis of audit observations allows for the identification of root causes, addressing not just the symptoms but the underlying issues that may impact program effectiveness.

Internal and external audit findings create a feedback loop, fostering a collaborative approach between auditors, FDAP personnel and relevant stakeholders. Engaging in a constructive dialogue with auditors and stakeholders helps in gaining a deeper understanding of the context behind the observations, facilitating more targeted improvements.

Observations serve as a catalyst for developing and implementing corrective actions to address identified deficiencies, ensuring that the FDA Program evolves to meet the highest standards. External audit observations provide insights into how well the FDA program aligns with industry standards and regulatory requirements, allowing for adjustments to ensure ongoing compliance.

Observations made during internal and external audits will provide the basis to improve the FDA Program within Riyadh Air.

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2 DATA PROTECTION AND LEGAL AGREEMENTS

2.1 CONFIDENTIALITY AGREEMENT/POLICY

FDAP generates enormous amount of data, and it is the responsibility of Flight Data Specialist under supervision of the VPCSSE to ensure the proper-

1. Access, which is restricted to authorized personnel, ensuring that only individuals with a legitimate need can retrieve or interact with the data.
2. Retention, to manage the life cycle of the FDAP data and data will be retained as per the organization policy.
3. Archiving, Overseeing the archiving process to ensure that historical FDAP data is stored securely and is readily available when needed. Proper indexing and categorization facilitate efficient retrieval.
4. Security, with the help of the IT department, will be ensured.
5. Retrieval, retrieving FDAP data when required for safety analysis, operational improvement, or other authorized purposes.

Data generated through the FDA program is confidential in nature and the integrity of FDA program rests upon protection of the FDAP data. Any disclosure of data that reveals flight crew member identity for purposes other than safety management, can compromise the voluntary provision of safety data, thereby compromising flight safety. Therefore, FDAP data will be provided in a de-identified manner with the permission of the VPCSSE.

The data access and security policy restrict access to FDAP information to authorized persons. In addition, when data access is required for airworthiness and maintenance purposes, troubleshooting and rectification through FDR Readout, the same shall be provided by Safety Office in a de-identified manner.

2.2 WITHDRAWAL OF CONFIDENTIALITY

In the event of accidents or serious incidents requiring external competent authority investigation, the investigative process takes precedence over the routine requirements of the Flight Data Analysis (FDA) program. During such occurrences, the following procedures and considerations will be in effect:

2.2.1 Retention of FDAP Data

1. Accidents and serious incidents will be prioritized for investigation and the associated Flight Data Recorder (FDR) data will be retained as a crucial element of the investigative process.
2. Recognizing that the retention and use of FDR data for investigation purposes may fall outside the scope of de-identification agreements.
3. Understanding that in the interest of a thorough investigation, the data may need to be preserved in its original, non-de-identified state.

2.2.2 Coordination with Investigative Authority

1. Collaborating closely with relevant aviation authorities, investigative bodies and any other stakeholders involved in the post-accident or incident investigation.
2. Complying with legal and regulatory obligations related to the retention and sharing of FDR data for investigative purposes.
3. Acknowledging that during the investigation of accidents or serious incidents, the standard de-identification protocols may be suspended.
4. Ensuring that the suspension is strictly limited to the period required for the investigation and is in accordance with legal and regulatory obligations.

2.2.3 Post-Investigation Procedure:

1. After the conclusion of the investigation, promptly resuming the standard de-identification procedures for FDR data as outlined in the Flight Data Monitoring program.
2. Ensuring that any retained data is handled in accordance with legal and regulatory requirements and is appropriately documented.

2.3 DATA PROTECTIVE PROVISIONS AND SECURITY

Data protection and security are treated as paramount concerns, reflecting Riyadh Air's commitment to safeguarding sensitive information. Provisions are in place to balance the accessibility of data for authorized personnel with robust security measures to prevent unauthorized access.

Under the supervision of VPCSSE, Flight Data specialist is responsible and plays a pivotal role in maintaining the security provisions for FDAP data. Following are the guidelines for the data protection and security:

1. Each individual accessing the FDA program must authenticate using unique credentials, ensuring that only authorized personnel can interact with sensitive flight data.
2. Detailed access logs are maintained to record each instance of login and interaction with the FDA program, providing traceability for accountability.
3. FDAP data is shared in a de-identified manner, with personal identifiable information removed to protect the privacy of flight crew members.
4. When sharing data externally, non-disclosure agreements are established to ensure that the receiving party complies with confidentiality and privacy standards.
5. Flight data is transferred from secured company FTP servers, employing encryption protocols to safeguard data during transit.
6. Raw and processed data are stored on company servers with robust security measures, including firewalls, intrusion detection systems and regular security audits.
7. Archiving of data follows established protocols, ensuring data integrity, accessibility, and compliance with retention policies.
8. Collaboration with the IT security team ensures that the FDA program aligns with the broader IT security infrastructure and policies of the organization.
9. Working closely with IT security teams to implement proactive security measures, including software patches, updates, and vulnerability assessments.

2.4 DATA RECOVERY

Ensures maximum acquisition of the aircraft raw data. As mentioned in the previous chapter, data acquisition is being done in two (2) ways: automatic and manual data retrieval. Nonetheless, the manual data retrieval process also serves as a contingency procedure should the wireless ground link fail, hence, complementing the target retrieval of flight data.

When an incident occurs, a timely and considered judgement is made by the Director of Safety and the DFDR data is required for an investigation. In such cases, the decision to quarantine the DFDR is taken expeditiously considering that the DFDR unit holds up 25 hours of data recording, hence, eliminating the possibility of the data being overwritten.

Validation of processed flight data is performed fervently to eliminate errors and spurious events. This process enables Safety Department to generate more plausible information that is useful in identifying possible threats and / or violations to the safety of the flights.

3 ORGANIZATION STRUCTURE

3.1 GENERAL

The Safety Department has established a dedicated monitoring cell under the supervision of Director of Safety with trained personnel to ensure that FDAP data monitoring is carried out on a continuous basis without any breakdown. An uninterrupted network along with resources in terms of hardware and software also being sourced so that failure of any single unit does not lead to breakdown of the system.

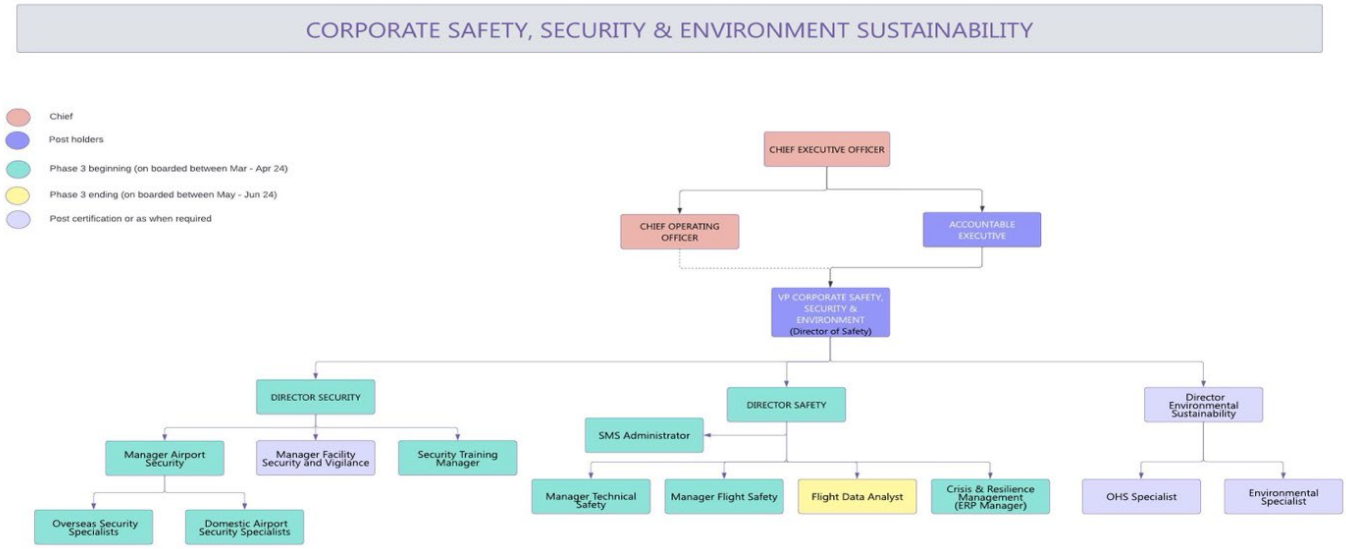

Figure 2 Organization Structure

3.2 VP CORPORATE SAFETY, SECURITY AND ENVIRONMENT

The VP Corporate Safety, Security and Environment (VP-CSSE) reports directly to the Accountable Executive to ensure continuous oversight and escalating critical safety, security, environment and Occupational Safety and Health (OSH). He works in close coordination with the Accountable Executive Post Holders and key stakeholders.

For duties and responsibilities refer Corporate Safety Management System Manual 1.3.2.

3.3 DIRECTOR SAFETY

The Director of Safety reports directly to the VP-CSSE and assists him in the effective establishment, development, implementation, monitoring, management, supervision, and performance of safety within Riyadh Air as per the applicable regulations, standards, and company requirements.

Duties and Responsibilities:

1. Responsible for the overall implementation and continuous improvement of FDAP.
2. Ensure a data storage library of the acquired data is maintained in a secured server for future analysis.
3. Oversee the effective application and implementation of Safety Management System and integrate FDAP processes with the Safety Management Processes.
4. Maintain close coordination with Flight Operations management with respect to issues identified through FDAP and track closures.
5. Ensure storage and documentation of data as per regulatory requirements.
6. Ensure Confidentiality of Safety Data generated through FDAP as per regulatory Guidelines.
7. Manage and control the retention of FDAP data as mentioned in SMS Manual including revising and developing documentation and implementation of FDAP process and procedure.
8. Propose acquisition of new hardware/software to meet technical changes, if any.
9. Work as Flight Crew Liaison officer whenever crew contact is required.

For other duties and responsibilities refer Corporate Safety Management System Manual 1.3.3

3.4 FLIGHT DATA SPECIALIST

The Flight Data Specialist reports directly to the Director of Safety and assists him in the effective establishment, development, implementation, monitoring, management, supervision, and performance of FDAP within Riyadh Air as per the applicable regulations, standards, and company requirements.

Duties and Responsibilities:

1. Maintains the Riyadh Air FDAP policies and procedures in line with current regulations and industry best practice.
2. Liaises with IT on all matters relating to the FDA program ensuring data availability and capture.
3. Obtain RAW Data and process this data with FDAP System on time to ensure efficient running of FDA program.
4. Perform data analysis and identify abnormalities that exceed defined thresholds.
5. Reviews Flight Data Analysis Program triggers and events for accuracy.
6. Updates Safety Reports with inputs based on FDAP reviews.
7. Coordinate analysis of Air Safety Reports with hard data generated on FDA program.
8. Design software routines able to gather data required for special flight performance studies.
9. Coordinate with FSO to generate monthly and yearly FDAP bulletins.
10. Generate all required statistics to facilitate the FDA Program.
11. Responsible for maintaining backups of all relevant company safety information generated from FDAP.
12. Develops classroom Safety Training material as required.
13. Assists with preparation of Safety Performance Indicators for submission to GACA.
14. Assist in preparation of quarterly statistics and trends.
15. Collates data and prepares presentations for quarterly Safety Action Group.
16. Conducts analysis and investigations in collaboration with the Safety Officer and Flight Operations.
17. Identifies hazards and risks emanating from Flight Data and offers recommendations where required.
18. Conducts activities pertaining to Safety in operational areas which include bulletins, events, seminars etc.
19. Develops material to aid Safety Promotion and Communication throughout the organization.

20. To be an active member of the Safety Action Group where meetings are held on a regular basis to address safety concerns, procedures, and improvement.
21. Participate in investigations.

For qualification and experience requirements please refer to Corporate Safety Management System Manual 1.3.4.4

3.5 GATEKEEPER

The Gatekeeper is a non-management pilot and is the only person permitted to connect identifying flight crew data with an event. The Gatekeeper serves as an essential bridge between CSSQE's Flight Data Specialist and Riyadh Air flight crew, ensuring that data-driven insights are effectively communicated and leveraged for safety improvements.

The Gatekeeper's duties and responsibilities include:

1. Data Interpretation: Conduct thorough analyses of flight data to identify trends, anomalies, and potential safety issues. Translate complex data sets into actionable information.
2. Communication: Act as a vital communication link between flight crews and the Safety and Flight Operations Departments, ensuring clear understanding and application of FDA findings.
3. Confidentiality and Trust: Maintain the highest levels of confidentiality to protect data integrity and foster a culture of trust and transparency within the flight crew community.
4. Safety Advocacy: Engage actively in safety meetings and discussions. Share insights from the FDA program to support informed decision-making and proactive safety measures.
5. Feedback Integration: Encourage and incorporate flight crew feedback into the FDA process.
6. Just Culture Support: Uphold and promote Riyadh Air's just culture principles, ensuring that FDA findings are used constructively for learning and improvement rather than punitive action.

3.6 FDAP REVIEW GROUP

1. Overview and Purpose:
    a. Oversight and Management:
        i. The FDAP Review Group serves as the oversight and management body for the Flight Data Analysis program.
    b. Ensuring Effectiveness and Compliance:
        i. The primary responsibility of the group is to ensure the effectiveness and compliance of the FDA program with safety standards and objectives.
2. Composition:
    a. Chairperson: VPCSSE: VPCSSE serves as the Chairperson of the FDAP Review Group, providing leadership and strategic direction to the group.
    b. Key Members: The FDAP Review Group includes key members representing different facets of aviation expertise:
        i. Vice President of Flight Operations
        ii. VP Technical
        iii. Director Flight Crew Training and Standards
3. Roles and Responsibilities:
    a. Chairperson VPCSSE:
        i. Provides overall leadership and guidance to the FDAP Review Group.
        ii. Ensures alignment with safety standards and objectives.
        iii. Represents safety perspectives in decision-making.
    b. Vice President of Flight Operations:
        i. Brings expertise in flight operations and airline procedures to the group.
        ii. Assesses the practical implications of FDAP findings on day-to-day flight operations.
        iii. Collaborates on implementing corrective actions and operational improvements.
    c. VP Technical Operations:
        i. Represents the maintenance and engineering perspective in FDAP discussions.
        ii. Assesses the impact of FDAP data on aircraft maintenance and reliability.
        iii. Contributes to the development of maintenance-related corrective actions.
    d. Director Flight Crew Training and Standards:

i. Brings insights into pilot training and crew performance to the group.

ii. Collaborates on incorporating FDAP findings into training programs.

iii. Provides input on improving crew skills and adherence to procedures.

4. Collaborative Decision-Making:

   a. Collective Expertise: The FDAP Review Group leverages the collective expertise of its members to make informed decisions regarding FDA program enhancements, corrective actions, and safety measures.

   b. Regular Meetings: The group conducts regular meetings to review FDA data, discuss findings and formulate strategies for continuous improvement.

5. Continuous Improvement and Feedback:

   a. Performance Evaluation: Regularly evaluates the performance and effectiveness of the FDA program against safety objectives.

   b. Feedback Loop: Establishes a feedback loop with relevant departments to address specific areas for improvement identified through FDAP data.

6. Reporting and Communication:

   a. Reporting to Executive Leadership: Provides regular reports to executive leadership on the status of the FDA program, major findings and implemented improvements.

   b. Communication with Stakeholders: Ensures transparent communication with relevant stakeholders, including regulatory bodies, regarding the FDA program and its safety initiatives.

7. Advisory Role:

   a. Advisory Function: Serves in an advisory capacity to the VPCSSE and other executive leaders, offering recommendations based on FDAP data analysis.

   b. Alignment with Organizational Goals: Ensures that FDAP initiatives align with broader organizational safety goals and strategies.

8. Adaptability and Evolution:

   a. Evolving with Industry Changes: Adapts the FDA program to industry changes, technological advancements, and evolving safety standards.

   b. Continuous Learning: Promotes a culture of continuous learning and improvement within the FDAP Review Group and the broader organization.

The FDAP Review Group plays a pivotal role in enhancing safety by leveraging data-driven insights to informed decision-making and drive continuous improvement initiatives. Provides assurance to the

organization, regulatory bodies and stakeholders regarding the effectiveness and compliance of the FDM program with safety standards.

3.6.1 FDAP Gate Keeper/ Flight Crew Liaison Personnel

The nominated and appointed Flight Safety Officer/s (FSO) are responsible for reviewing and validating each flight. If there is no red event identified on the flight, Flight Data will be released to operating crew for the flight. This provides crew with a view of the flight they have operated for their information and educational purpose.

FSOs and Flight Data Analyst will ensure that all significant/red events are assessed/coordinated with the safety office for further actions as defined in this manual.

3.7 TRAINING

3.7.1 General Training

Following are general training requirements for the FDAP Analyst, users, and the gate keepers for effective functioning of the program:

1. Training in the functioning of FDAP software for data analysis.
2. Training in the functioning of FDAP software designing algorithms for event detection and design snapshot parameters, program data frame.
3. Training in the functioning of FDR and CVR readout software.
4. Training in basic digital data transfer protocol.

3.7.2 Software Training

3.7.3 Information For Senior Management and Stakeholders

A regular statistical data of general findings and relevant corrective measures will be communicated to operational personnel and reports identified as safety performance indicators directly connected to FDM that shall be presented to senior management during Safety Review Board meetings.

Following are the guidelines for the same:

1. **Regular Statistical Data and General Findings**:
    a. **Communication to Operational Personnel:** A regular statistical data report (Monthly/Yearly) containing general findings and relevant corrective measures is disseminated to operational personnel.
    b. **Safety Performance Indicators**: Reports that are identified as safety performance indicators directly linked to FDAP are compiled for in-depth analysis.
    c. **Presentation to Senior Management**: During Safety Review Board meetings, senior management is presented with these safety performance indicators, providing a comprehensive overview of the FDA program's impact on safety.
2. **Immediate Attention and Reporting to Senior Management**:
    a. **Identification of Urgent Matters**: If a specific matter within the FDA program requires immediate attention due to its critical nature, it is promptly identified.
    b. **Communication by Director of Safety**: The Director of Safety, being the focal point for safety matters, is responsible for communicating urgent issues to senior management.

c. **Reporting to Accountable Executive**: In cases demanding the attention of the highest executive authority, the Accountable Executive is notified immediately. This ensures swift decision-making and action.

3. **Reporting Structure**:

a. **Safety Review Board Meetings**: Scheduled Safety Review Board meetings serve as a platform for presenting comprehensive reports, fostering a structured discussion on safety performance indicators derived from FDAP.

b. **Routine Operational Personnel Communication**: Routine communication to operational personnel ensures that they are continuously informed about general findings and corrective measures, promoting transparency and awareness.

c. **Customized Reporting**: Reporting mechanisms are designed to be customized, tailoring information for different audiences, detailed for senior management and more operationally focused for day-to-day personnel.

4. **Collaborative Decision-Making**:

a. **Discussion and Analysis**: SAG meetings facilitate in-depth discussions and analysis of FDM data, encouraging collaborative decision-making for continuous improvement.

b. **Interdepartmental Collaboration:** The FDA program involves collaborative efforts between the safety, operational and management teams, fostering a culture of shared responsibility for safety outcomes.

5. **Continuous Improvement Cycle**:

a. **Feedback Loop**: The communication process establishes a feedback loop, allowing for insights and recommendations to flow back into the FDA program, contributing to its continuous improvement.

b. **Iterative Enhancement**: Lessons learned, and corrective actions taken are integrated into subsequent FDAP reports, forming an iterative enhancement cycle for safety measures.

6. **Accountability and Escalation**:

a. **Clear Accountability**: Clear lines of accountability are established, with the Director of Safety taking the lead in immediate communication and escalation when necessary.

b. **Timely Response**: The immediate reporting structure ensures that urgent matters receive timely attention from senior management, promoting a proactive approach to safety management.

4 FDAP DATA ANALYSIS

4.1 FDA PROGRAM COMPONENTS

Flight data is an integral basis of flight analysis. Flight data is downloaded/automatically transferred from the aircraft or manually downloaded. This data is further analyzed for anomalies, events, and trends as part of the FDA program. Processes are in place to minimize the chance of data loss and ensure timely download of DFDR data in case QAR data becomes corrupt or missing.

4.1.1 Airborne Data Acquisition System

4.1.2 Data Download and Airborne System Maintenance and Support

All aircraft are equipped with wireless QAR / QAR or equivalent device for easy retrieval of the recorded data. The Technical Service Department ensures regular maintenance and automatic transfer of data to ground based stations or if not transferred automatically, it will be downloaded and upload the same to a shared drive at base stations. The data is accessed by the Safety Office and uploaded on the computers where GE Aerospace's WASABI is installed.

Procedure

1. QAR/ FDR Data of B787-9 aircraft is extracted at night halt/layover stations and uploaded to the FTP Server in the folder of the respective station.
2. Safety personnel copies the data uploaded by each base station onto the corresponding folder (arranged by station name) in the dedicated computer's local hard drive. After archiving the data stored in the local drive is permanently deleted from the local drive.
3. Data of B787-9 aircraft is also automatically transferred to FTP server by the WQAR as per data transfer queue defined by Technical Service Department .

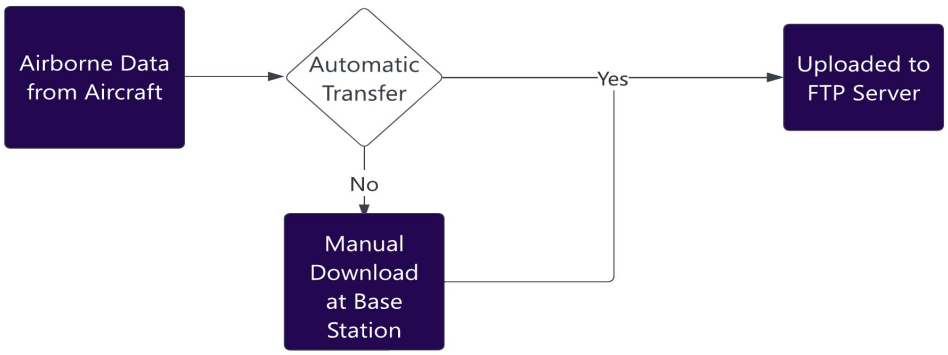

Figure 3 QAR Data download flow chart

4.1.3 Ground Data Replay and Analysis System (GDRAS)

FDA Exceedance analysis involves converting digitally recorded flight data into readable format and running through filters with the help of GE Aerospace FDAP System. Exceedance limits of various parameters for deviation from flight manual limits, standard operating procedures, and other aircraft related documents, have been configured in the software. The deviations beyond the selected alerts as detected by the software shall be reviewed and recorded by FDA Analyst. The recorder manufacturer supplies details of parameter recordings for configuring in software.

4.1.4 Flight Data Analysis – Service Provider

Riyadh Air has contracted Flight Data Analysis services from GE Aerospace and will be using their Safety Insight software for the analysis of flight data., The GE Safety Insight service enables the decoding of flight data into a logical layer of global flight parameters, allowing Riyadh Air safety teams to evaluate and analyze data against a comprehensive library of measurements and safety events, including powerful analytics processing capabilities. It provides a secure environment to ingest, cleanse, analyze, and report flight data.

4.1.5 Other Equipment

As the GE Aerospace Safety Insight offers a web-based solution for proactively managing risk in flight operations in support of Riyadh Air FDAP, it can be accessed using the FOQA/FDM desktops/Laptops by authorized personnel.

The GE Aerospace 's WASABI (Wide Area Store-and-forward Aviation Binary Interchange) data collection protocol will be installed on a local machine (Desktop / Laptop) available at safety office for automatic transfer of raw data files to the Safety Insight software.

4.2 COLLECTION AND INITIAL SCREENING/FILTERING OF DATA

1. The data transferred from aircraft are un-archived and transferred to Safety Server.
2. These folders are then archived in the following format by safety personnel: RX-ABCDDMMYYYYHHMMSSM.zip where 'RX-ABC' represents the registration of the aircraft, 'DDMMYYYY' represents the date when the data is being archived, 'HHMMSS' represents the time when the data is being archived and 'M' is a fixed constant.
3. The archived data is then copied into the backup drive, with the backup folders arranged by year, month, and date respectively.
4. The raw data for each aircraft is available in the Back-up drive for a minimum period of 5 years.
5. Each day the QAR / DFDR database is updated. The database named "FDIMU YYYY" is an Excel Workbook (stored in a secured server) with different worksheets for each day where YYYY represents the year. The following columns are updated:
    a. Aircraft Registration
    b. Station (from which data has been uploaded)
    c. Date (as per the modification of the last file in the folder)
    d. First File Number
    e. Last File Number
    f. Remarks
6. This database is maintained for traceability and to ensure data continuity. It is to be monitored that the First file number for a particular registration exceeds the Last file number of the same registration from the day when data was last received by one.

4.3 DATA TRANSFER

After archiving, the data is copied into the "Autonomous" folder whose location is mapped in the GE Aerospace 's WASABI data collection protocol. The data is then automatically extracted from this folder by Safety Insight software when the automatic analysis command is given.

Safety Insight software runs the raw data file and triggers events as defined in the software's event detection algorithm.

Following is the process for completing this:

1. **Archiving Process**:
    a. **After Flight Data Monitoring (FDM) Analysis**: Following the initial analysis of flight data, the results are archived for record-keeping and further reference.
    b. **Copying Data to the "Autonomous" Folder**: The archived data is copied into the designated "Autonomous" folder. This folder serves as a centralized location for data that is ready for further automated processing.
2. **Mapping Location in Analysis Software**:
    a. **Configuration in Analysis Software**: The location of the "Autonomous" folder is mapped within the Safety Insight software using WASABI. This mapping ensures that the software knows where to retrieve data for subsequent automated analysis.
3. **Automatic Extraction and Analysis**:
    a. **Triggering Automatic Analysis Command**: The Safety Insight software is equipped with the capability to automatically extract and analyze data. This process is initiated by issuing a command for automatic analysis.
    b. **Retrieving Data from "Autonomous" Folder**: Upon receiving the automatic analysis command, the software retrieves data from the pre-defined "Autonomous" folder.
    c. **Raw Data File Processing**: The Safety Insight software processes the raw data file retrieved from the "Autonomous" folder, utilizing its algorithms and functionalities.
    d. **Event Detection Algorithm**: The Safety Insight software incorporates an event detection algorithm designed to identify specific events or exceedances in the flight data.
    e. **Automated Event Triggering**: As the Safety Insight software runs the raw data file, it automatically triggers events based on the defined criteria within the event detection algorithm.

4.4 EVENT ANALYSIS

In compliance with GACA regulations, entire data of a flight shall be analyzed to determine if any flight parameter had exceeded the laid down limit. For the flights in which exceedances are detected, a detailed analysis of flight data shall be carried out to check whether the flight was handled as per the Standard Operating Procedures.

As there are more accidents during approach and landing phases, detailed analysis of the approach and landing phases of all flights shall be carried out, to detect any deviations from the normal approach profile and whether the approach was stabilized or not.

Guidelines for completing an event analysis are as follows:

1. **Overall Data Analysis**:
    a. **Flight Parameter Exceedances**: The entire data of each flight is subject to analysis to identify any flight parameters that have exceeded the prescribed limits.
    b. **Detailed Analysis for Exceeding Flights**: For flights with identified parameter exceedances, a comprehensive and detailed analysis is conducted to assess adherence to Standard Operating Procedures (SOPs).
2. **Emphasis on Approach and Landing Phases**:
    a. **Focus on High-Risk Phases**: Recognizing the higher risk during approach and landing phases, specific emphasis is placed on analyzing these segments of all flights.
    b. **Stabilized Approach Assessment**: Detailed analysis of approach and landing phases includes assessing whether the approach was stabilized, conforming to defined criteria for stability.
3. **Specific Airport and Runway Analysis**:
    a. **Airport and Runway Performance**: Data related to landings is analyzed with a focus on specific airports and runways. This analysis covers the performance of limited airfields to ensure conformity with SOPs for those specific locations.
    b. **Runway-Specific Considerations**: The analysis accounts for runway-specific factors, considering variations in layout, length, and conditions that may impact the landing performance.
4. **Special Takeoff Procedure Analysis**:
    a. **Airfields with Special Takeoff Procedures**: For airfields where special takeoff procedures are established, the FDM analysis scrutinizes whether the takeoff profile aligns with the prescribed special procedures.

b. **Record Keeping for Training Purposes**: Results of the analysis, especially deviations from special takeoff procedures, are recorded separately. This information serves as valuable training material for new pilots.

4.5 EVENT CLASSIFICATION

1. Low Severity Events (Yellow)
    a. Low severity events are statistically important and provide trends for an airline. Low severity incidents will only be used for analysis, no gatekeeper review is required.
    b. A low severity event could be combined with a Medium or High severity event to form a combination Event which would require further analysis and actions.
2. Medium Severity Events (Amber)
    a. Medium severity events are statistically important and provide trends for an airline.
    b. A Medium severity event is analyzed and could be combined with a Low or Medium or High severity event to form a Combination Event which would require further analysis and actions.
    c. Events falling into this category require the attention of the Gatekeeper and where required even a subject matter expert.
3. High Severity Events (Red)
    a. High severity events are statistically important and provide trends for an airline.
    b. A High severity event may require a specific validation and analysis.
    c. Events falling into this category require the attention of the Gatekeeper and where required even the Director of Flight Crew.

4.6 GUIDANCE ON DEFINING CUSTOM EVENTS

Some of the events are specific to a special procedure or an airport. Such events shall be configured into FDAP software based on SOPs by the FDAP manager. If required, help from the software provider may be taken to define the event in the system.

1. **Identification of Special Events**:
    a. **SOP-Driven Events**: Special events specific to SOPs or airports are identified, considering factors that require dedicated monitoring.
    b. **Collaboration with Director of Safety:** The Director of Safety collaborates with the relevant stakeholders, including SOP creators, to clearly define and understand the criteria for these special events.
    c. **Software Provider Collaboration**: If needed, collaboration with the FDAP software provider is initiated to seek assistance in configuring these events into the system.
2. **Configuration and Setup**:
    a. **Flight Data Specialist's Role**: The Flight Data Specialist takes the lead in configuring the identified special events into the FDAP software based on the established SOPs.
    b. **Collaboration with Software Provider**: Assistance from the software provider is sought, if necessary, to ensure accurate and effective configuration of these events within the FDAP system.
3. **Testing Phase**:
    a. **Duration of Testing**: A dedicated testing period of 15 days (about 2 weeks) is allocated after the configuration of special events in the system.
    b. **Outcome Analysis**: Regular analysis is conducted during the testing phase to assess the specific and desired outcomes of the configured special events.
    c. **FDAP Review Group Involvement**: Results of the testing phase are shared with the FDAP Review Group for their assessment and input.
4. **Production Deployment**:
    a. **FDAP Review Group Verification**: The FDAP Review Group verifies the outcomes of the special events based on the testing phase results.
    b. **Transition to Live Environment**: Once verified, the configured special events are deployed into the live environment for active monitoring during regular flight operations.
5. **Periodic Review in Production**:
    a. **Ongoing Accuracy Assessment**: A periodic review is carried out to ensure the ongoing accuracy and relevance of the configured special events in the live environment.

b. **FDM Review Group Oversight**: The FDAP Review Group continues to oversee and assess the performance of special events, providing feedback for potential adjustments.

6. **Continuous Improvement**:

a. **Feedback Loop Integration**: Insights gained from the periodic reviews contribute to a continuous improvement loop, allowing for refinement of special events and associated monitoring criteria.

b. **Iterative Enhancement**: The iterative process ensures that the FDM system evolves to meet changing requirements, SOPs, or any adjustments in the aviation environment.

7. **Documentation and Reporting**:

a. **Detailed Documentation**: The entire process, including identification, configuration, testing, production, and periodic reviews, is thoroughly documented for reference and auditing purposes.

b. **Reporting to Stakeholders**: Reports on the outcomes, feedback, and performance of special events are communicated to relevant stakeholders, ensuring transparency and accountability.

4.7 SETTING THRESHOLDS

The Safety office shall establish threshold values in consultation with the FDAP review Group including the Flight Operations Department for exceedance for each aircraft type in operation. The final threshold limits shall be signed off, and some shall be incorporated into the Flight Data Analysis Program software.

The threshold limits shall be in conformity with the operational documents and SOPs.

Following is the process to accomplish this:

1. **Safety Office Involvement**:
    a. **Threshold Definition Initiation**: The Safety Office initiates the process of defining threshold values for exceedances in consultation with the FDAP Review Group.
    b. **Collaborative Decision-Making**: Collaborative discussions take place to involve key stakeholders in the FDAP Review Group, including representatives from flight operations, safety, and other relevant technical experts.
2. **Consultation with FDAP Review Group**:
    a. **Group Composition**: The FDAP Review Group, comprising of experts from various relevant domains, convenes to discuss and establish threshold values.
    b. **Operational and Technical Inputs**: Operational personnel provide insights into day-to-day flight operations, while technical experts contribute their knowledge on aircraft capabilities and limitations.
3. **Alignment with Operational Documents and SOPs**:
    a. **Reference to Operational Documents**: The threshold values are carefully reviewed to ensure alignment with existing operational documents, including aircraft manuals, guidelines, and company-specific SOPs.
    b. **SOP Conformity**: The established threshold limits conform to the defined procedures and guidelines outlined in the Standard Operating Procedures.
4. **Sign-Off Process**:
    a. **Finalization of Threshold Limits**: The FDAP Review Group finalizes the threshold values after considering all operational, technical and safety aspects.
    b. **Sign-Off by Key Stakeholders**: The final threshold values are subject to sign-off by key stakeholders within the FDAP Review Group, including representatives from the Safety Office.

5. **Incorporation into FDAP Software**:
    a. **Software Integration Planning**: The Safety Office collaborates with the IT or GE team responsible for the Flight Data Monitoring system to plan the integration of the finalized threshold values.
    b. **Software Configuration**: The agreed-upon threshold values are configured into the Safety Insight software to ensure that the system recognizes and monitors exceedances against these parameters.
6. **Continuous Monitoring and Review**:
    a. **Regular System Checks**: The Safety Insight system is regularly monitored to ensure that the configured threshold values are effectively capturing and flagging relevant exceedances.
    b. **Periodic Review by FDAP Group**: The FDAP Review Group periodically reviews the effectiveness of the threshold values, considering any changes in operational practices or aircraft configurations.

4.7.1 Adjustments And Changes to Thresholds

The set limits will be reviewed as and when required but at least once in every year in consideration of following:

1. **Regular Schedule**:
    a. **Annual Review Cycle**: The set limits for exceedances are subject to a comprehensive review at least once every year.
    b. **Flexibility for Triggered Reviews**: Additionally, the review process may be triggered if significant events, changes, or regulatory updates require a more immediate assessment.
2. **Factors Considered in the Review**:
    a. **GACA Regulations**: GACA regulations are thoroughly examined to ensure that the set limits align with current regulatory standards and requirements.
    b. **Operating Experience**: Insights gained from ongoing monitoring activities, including the analysis of exceedances and operational data contribute to the review process.
    c. **Crew Inputs**: Inputs and feedback from the operating crew are considered, as they provide valuable perspectives on the practical aspects of adhering to the set limits during flight operations.
    d. **Manufacturer Recommendations**: Manufacturer recommendations and guidelines related to aircraft performance and limitations are reviewed to incorporate any relevant updates or changes.

e. **SOP Changes**: Changes in Standard Operating Procedures (SOPs) are considered, ensuring that the set limits align with the latest procedures and protocols.

3. **Review Team Formation**:

   a. **Multi-disciplinary Team**: A review team, comprising of representatives from safety, operations, technical experts, and relevant stakeholders, is formed to ensure a comprehensive assessment.

   b. **Involvement of FDM Review Group**: The FDAP Review Group, established earlier, may actively participate in the review, bringing their expertise to the evaluation process.

4. **Collaborative Assessment**:

   a. **Documented Evaluation**: The review process involves a detailed documented evaluation of each factor, examining regulatory compliance, operational experiences, crew inputs, manufacturer recommendations and SOP changes.

   b. **Group Discussions**: Collaborative group discussions are conducted to gather insights, share expertise, and ensure that all perspectives are considered.

5. **Adjustments and Recommendations**:

   a. **Identified Changes**: If required, adjustments to the set limits are identified based on the findings of the review, considering the factors mentioned.

   b. **Recommendations for Approval**: The review team formulates recommendations for any necessary changes, which are then presented for approval.

6. **Approval and Implementation**:

   a. **Final Approval**: The proposed changes to the set limits are subject to final approval by key stakeholders, including safety officers, regulatory compliance officers and relevant management personnel.

   b. **Implementation Plan**: Upon approval, an implementation plan is developed, outlining the steps to integrate the revised set limits into the FDA system.

4.8 EXCEEDANCE DETECTION AND ANALYSIS

If any exceedances have been detected, a detailed analysis of the flight will be carried out by a dedicated Safety Specialist (Flight Data Specialist) to check whether the flight was handled as per the Standard Operating Procedures. If the flight is found to be in the MEDIUM or HIGH severity band, an appropriate report for the same shall be generated giving the actual value of the parameter, the specified limit for the same, the time of the event and the other relevant flight details to Director of Safety for review.

Post validation, correlation and analysis of the exceedance event, suitable remedial actions will be determined. The flight risk shall also be determined after corroborating the various factors in conjunction with the flight profile, Environmental conditions, Aerodrome limitations/SOP's etc.

4.9 REVIEW AND PLAYBACK

The recommended remedial actions prescribed by the Gatekeeper based on detailed analysis will be reviewed and accepted by the Director of Safety. This may include Email to crew for information, crew comments, debrief/counselling, changes in SOP etc.

Exceedance events that require corrective and/or preventative actions may be escalated to a Safety Investigation Panel for further recommendation of suitable remedial actions.

Exceedances generated during the training flights shall be communicated to Crew, Vice President of Flight Operations, Director Flight Crew Training and Standard for analysis and de-briefing with an emphasis on the "Learning curve".

If required, Gatekeeper is responsible to replay the data for the benefit of the crew for better understanding of the event. Only relevant flights are to be replayed for crew. Only one such request per flight will be considered and no duplicate data will be provided to the crew.

4.10 GROUND DATA REPLAY AND ANALYSIS SYSTEM

Riyadh Air is using GE Aerospace Safety Insight software as a ground data replay and analysis system. It is a web-based solution for proactively managing risk in flight operations in support of airline Flight Data Analysis Programs (**FDAP**). The GE Aerospace Safety Insight solution enables the decoding of flight data into a logical layer of global flight parameters, allowing Riyadh Air safety teams to evaluate and analyze data against a comprehensive library of measurements and safety events.

The main product consists of data ingestion, processing analytics, and user interface. The Safety Insight services and features include:

1. A secure hosted infrastructure (Microsoft Azure).
2. GE Aerospace proprietary data collection and transfer software, WASABI, can collect and securely transmitting data to GE's secure servers over HTTPS or via secure file transfer (SFTP) or via Message Queues.
3. Access to an exclusive library of analytics profiles and sophisticated algorithms.
4. Comprehensive extraction and cleansing of flight data via analytic features that automatically flag anomalies and erroneous readings to ensure accurate, useable results, as well as a strong de-identification protocol when required.
5. Complex matching algorithms that automatically fuse flight data with weather data, trajectory correction, navigation, and terrain data at the flight record level. This provides context and insights to understand complex operational problems and drive proven operational results.
6. An advanced integrated database and processing architecture that delivers speed and automation, highly scalable for use across multiple locations easily and quickly expandable to accommodate additional aircraft, aircraft fleets and to facilitate remote user groups.

4.11 TREND ANALYSIS

1. A regular statistical data of general findings and relevant corrective measures, if any, shall be communicated to operational personnel.
2. Statistical Data analysis report shall be prepared quarterly and same shall be disseminated to Flight Operations
3. If any unhealthy trend is observed during the trend analysis, the same shall be discussed during Flight Ops Safety Action Group meetings.
4. If Any Corrective/ Preventive action required to address the FDA Trend, Same shall be addressed by Flight Operations and Action Taken report shall be sent to Safety office.
5. Review of Such corrective actions shall be reviewed periodically.
6. A detailed Flight Operations SPI analysis report shall be prepared by FDAP Cell every month and the same shall be shared with Flight Operations for detailed analysis.
7. As a part of SMS, Safety Promotion Component, the information is shared with all the stakeholders on a regular basis through various platforms mentioned below, but not limiting to:
    a. Safety Newsletters
    b. Flight Operations Safety Action Group Meeting
    c. Fleet Gathering of Pilots
    d. SMS Refresher for Pilots
    e. Safety Bulletins

4.12 DATA RECOVERY

Riyadh Air ensures maximum acquisition of the aircraft raw data. As mentioned in this chapter, data acquisition is being done in two (2) ways: automatic and manual data retrieval. Nonetheless, the manual data retrieval process also serves as a contingency procedure should the wireless ground link fail, hence, complementing the target retrieval of flight data.

When an incident occurs, a timely and considered judgement is made by the VPCSSE if the DFDR data is required for an investigation. In such cases, the decision to quarantine the DFDR is taken expeditiously considering that the DFDR unit holds up 25 hours of data recording, hence, eliminating the possibility of the data being overwritten. Validation of processed flight data is performed fervently to eliminate errors and spurious events. This process enables the Safety Department to generate more plausible information that is useful in identifying possible threats and/or violations to the safety of the flights.

In case, due some reasons data is not available for analysis, following are the procedures to be followed:

1. For aircraft in which data is transmitted through WAR, aircraft was flying (as per rostering software) and was not received, an entry is made in the remark's column stating "DATA NOT TRANSMITTED"
2. If the data for an aircraft registration is found to be missing, an entry is made in the remark's column stating, "DATA MISSING".
3. If the station has sent the mail stating data was extracted from the aircraft but was not uploaded to the FTP Server, entry is made in the remark's column stating, "DATA NOT UPLOADED".
4. If the data is uploaded, post the download process the same will be done as per data availability, but not later than 24 hours.
5. If the data uploaded for any registration is found to be corrupt, entry is made in the remark's column stating, "DATA CORRUPT".
6. In all the above-mentioned cases i.e., data missing, data corrupt, data not transmitted, and data not uploaded, the entries in the database are highlighted in yellow.
7. After the data downloaded for a particular day has been extracted into the database, the downloaded data is reconciled with the data that has been downloaded and the mails received from the station.
8. This is done by sorting the data available in the folder for that date, aircraft registration-wise. It is then cross-checked whether the data for all aircraft registrations that were downloaded or for which mail was received are available in the database and archive folder. If not, the missing data is archived again and placed in the Autonomous folder for analysis.
9. Lastly, an email is sent to the station in charge (for maintenance & engineering) of respective stations (and other concerned personnel) by Flight Data Specialist confirming the receipt of the

data uploaded by them. The content of this email is the portion of the database filtered for their respective station name minus the remarks column.

10. For missing data, corrupt data or data not transmitted, a separate email is sent to the respective station containing only the missing data, corrupt data or data not transmitted entries from the database including the remarks column. They are urged to take necessary action and upload the missing/corrupt data at the earliest. Email reminders are sent till the time the data in question is recovered.

11. A consolidated list mentioning the details of all data downloaded from aircraft and missing/corrupt/data not transmitted are sent to LMM, CAM, MCC for coordination and ensuring data retrieval.

12. Once the missing/corrupt data has been recovered, the entries are un-highlighted.

13. A monthly reconciliation of data is carried out for all flights using Safety Insight software and Scheduling software.

SL. No.	Aircraft Registration	Station	Date	First File Number	Last File Number	Remarks

Table 1 QAR Data Recovery Format

4.13 DATA RETENTION

FDAP process involves different types of data files. These are:

Aircraft raw data/DFDR data. This data are the ones acquired from the aircraft through manual downloading or automatically transmitted through Wireless Ground Link.

Type of file	Retention period
Raw Data (FDIMU/WQAR/DFDR)	Five (5) years
Flight Files generated after data processing on GE System	Five (5) years

Table 2 Data Retention Period

4.14 USE OF JUST CULTURE IN FDM PROGRAM

Just Culture, as defined in CSMSM Chapter 1.1.2.1, "is an atmosphere of trust in which people are encouraged, even rewarded for providing essential safety-related information, but in which they are also clear about where the line must be drawn between acceptable and unacceptable behavior."

It also refers to a way of safety thinking and fosters both personal accountability and corporate self-regulation in safety matters. This is applicable to the FDA program as well.

4.15 NON-PUNITIVE SAFETY REPORTING POLICY WITH RIYADH AIR

The Safety Department fully endorses non-punitive reporting system within Riyadh Air as this will develop and foster a culture of mutual trust.

The Department encourages all personnel to take preventive action and report any safety threat noted within their respective workplace in accordance with prescribed reporting procedures. Hence, no disciplinary actions will be taken against the personnel who acted to prevent an injury or reports any risk. Nonetheless, those errors that resulted from an illegal activity or willful misconduct may lead to disciplinary actions taken against the reporter or the personnel involved.

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5 CREW CONTACT / COUNSELING

5.1 CREW CONTACT / COUNSELING GUIDELINES

Following need to be considered and followed by the Gatekeeper while contacting a Crew for understanding the event:

1. Confidentiality and Courtesy:
    a. Contacts must be conducted with strict confidentiality.
    b. Accord due courtesy to the crew members concerned.
2. Communication Methods:
    a. Contacts may be in the form of email, telephone/video call or in-person.
3. Corrective Action:
    a. The Gatekeeper may recommend corrective action, in concurrence with the Director of Safety, if deemed necessary.
    b. Recommended corrective actions must be documented.
4. Contact Report:
    a. A contact report must be filled out by the gatekeeper.
5. Record Keeping:
    a. The contact form shall be kept in database.
6. Data Discussion:
    a. FDA readouts must be discussed with the crew member during contact as appropriate.
7. Highlighting Procedural Deviations:
    a. Procedural deviations must be highlighted and brought to the notice of the crew member.
8. Learning Curve Emphasis:
    a. Discuss the individual's previous exceedances/incidents, history (if applicable) with an emphasis on the "learning curve."
9. References to Relevant Extracts:
    a. References to relevant extracts (e.g., SOP/FCOM/MEL/CAR and company circulars) must be discussed during contact.
10. Additional Considerations:

a. The contact/counseling should be conducted after due consideration.

b. Crew identification for the relevant flight will be provided by the Flight Data Specialist only to the Gatekeeper. Any further identification requires explicit approval from VPCSSE and VPFO.

c. The contact aims to provide better understanding of events and gather contextual information.

6 ACTING ON RESULTS AND FOLLOW-UP

6.1 FDAP REPORTS, PUBLICATION AND EDUCATION

1. **Trend Monitoring**:
   a. **Objective:** Monitor statistical trends of exceedances.
   b. **Process**:
      i. The Safety Department sends periodic reports (Monthly/quarterly/yearly) to the Vice President of Flight Operations and Director-Flight Crew Training and Standard.
      ii. Findings and trends are communicated to detect inherent weaknesses in the system.
      iii. Director-Flight Crew Training and Standards in consultation with Director-Flight Crew and VP-Flight Operations formulate corrective actions.
      iv. Operational personnel receive general findings and suggest corrective measures.
      v. Director of Training incorporates findings into crew training programs.
2. **Refresher Training**:
   a. **Objective:** Bring exceedance trends to the attention of pilots during refresher trainings/seminars/workshops.
   b. **Process**:
      i. Pilots are informed about trends identified in exceedances.
      ii. Special attention is requested for areas that require focus.
3. **Hazard Identification**:
   a. **Objective**: Integrate hazards identified from the FDA program into the Safety Management System and Hazard Register.
   b. **Process**:
      i. Hazards identified are documented and integrated into the Safety Management System.
      ii. A Hazard Register is maintained for suitable mitigation measures.
4. **Maintenance Programs**:
   a. **Objective**: Share data with Engineering to improve maintenance programs or analyze defects for rectification purposes.
   b. **Process**:
      i. Relevant data is shared with the Engineering department.

ii. Information is used to enhance maintenance programs and analyze defects for rectification.

5. **Flight Operations Safety Awareness Programs**:

a. **Objective**: Coordinate with the Safety Department to generate trends for safety promotion activities among the crew.

b. **Process**:

i. Flight Operations collaborates with the Safety Department.

ii. Trends are utilized to create safety awareness programs for the crew.

6. **Overall Considerations**:

a. **Periodicity**: Data is utilized periodically (Monthly/quarterly/yearly) for different purposes.

b. **Collaboration**: A strong collaboration between Safety, Operations, Training, and Engineering departments.

c. **Continuous Improvement**: Corrective actions and mitigation measures contribute to continuous improvement in safety and operational practices.

7 PROTECTION AND RETENTION OF FDAP DATA

7.1 OVERALL APPROACH

The main objective of FDA program is to improve safety by identifying trends, not individual acts. Therefore, data obtained from FDA will not be used primarily as the basis to take disciplinary action against the pilot. The data will only be used for Accident prevention purposes and the information shall not be used in a way different from the purposes for which it was collected.

Onboard the aircraft, the electronically derived recorded data can contain commercially and personally sensitive information. As such, it is important that access to it is carefully controlled and limited to those people with a need to be aware of the data contents. The CVR and FDR are protected from any inappropriate use such as public disclosure or the disclosure of crew information.

FDAP generates enormous amount of data, and it is the responsibility of FDAP manager to ensure the proper-

1. Access, Retention and Archiving
2. Security
3. Retrieval

Data generated through FDAP program is confidential in nature hence proper safeguards shall be implemented to avoid any unauthorized access to the data.

7.2 DATA STORAGE, RETENTION AND DE-IDENTIFICATION POLICY

In Riyadh Air, all flight data and records are stored on company servers with access restrictions. Access matrix to these servers will be as per table:

User	Server / Software	Data / Access Level	Purpose
Maintenance Personnel		Raw Data	Upload of Downloaded Data (QAR/FDR and CVR)
FDM Cell		Raw, Processed Data, FDM Records, Reports and CVR Raw, processed Data	For data processing, analysis, and grading.
VP- Corporate Safety, Security and Environment/Director Corporate Safety/Flight Data Specialist		Processed Data, FDM Records and Reports	For data analysis and evaluation
Individual Flight Crew		Individual Reports	Self-Analysis

Table 3 Data Access Restriction to Servers

7.3 PROCEDURES FOR IMPLEMENTING AND AUDITING SECURITY MECHANISMS OF DATA

1. The Flight Data Monitoring Program with all flight data readout facility is managed by the Safety Office.
2. Flight data is downloaded from secured company FTP servers and raw data is stored on company servers. The processed data by Software also stores and archives data in secured company servers.
3. Safety Insight Software is a web-based software and dedicated Safety FDM team members access this as per RXI IT security policy.
4. The access to Safety Insight is restricted to dedicated FDM team members and the password is shared with only FDAP team members.
5. The FDAP reports and database and other extracted data from the Safety Insight software is stored in a shared drive-in dedicated folder which is restricted to only Safety-FDAP team members.
6. The access to the servers is restricted through company IT security infrastructure and governed by the IT security policy. For any data shared with external service provider or agency, non-disclosure agreement is signed as per IT security policy.
7. The above policies and processes ensure FDAP data remains protected from unauthorized access and use.
8. With the advancement of technologies (hardware/software), the data management policies will be reviewed, and necessary changes will be introduced in consultation with the digital team/GE team as and when required to ensure safe and secure access to data and improve data management methods and procedures.

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8 SERVICEABILITY AND THE FDM SYSTEM

8.1 INTRODUCTION

1. Cockpit Voice Recorders or CVRs are downloaded and recordings from all channels are monitored for the purpose of integrity, data validity and quality of CVR recordings.
2. Digital Flight Data Recorders or DFDR are downloaded and readouts for all recorded parameters are monitored to check DFDR data integrity, validity, and quality of recordings.
3. A DFDR Test Report is also required to be sent to Engineering for an aircraft's ARC or lease return.
4. DFDRs are used for the purpose of incident investigation.
5. CVRs are only used for the purpose of serious incidents and accident investigation.

8.1.1 RESPONSIBILITY

It is the responsibility of the Director of Safety to ensure that the procedure below is adhered to.

It is the responsibility of the Flight Data Specialty to download CVRs and FDRs daily and update their respective databases.

8.2 PROCEDURE

8.2.1 CVR Download and Integrity Check:

1. CVR's Data is uploaded in the folder of the respective station from where it was downloaded from the aircraft on the sFTP Server.
2. Flight Data Specialist then downloads these files and stores them on the server. CVRs are maintained in the Back-up server for a period of 05years.
3. The files downloaded on a particular day are then decompressed using the CVR software as applicable.
4. Once decompressed, each channel is checked by the FDM-Analyst to check that each channel of the recorder has proper recordings and there is no abnormal noise.
5. For each CVR received by Safety Office, the "CVR Data" log needs to be updated.
6. The following details are to be updated in the Log:
    a. Aircraft Registration
    b. Flight Number
    c. Sector
    d. Incident Remark
    e. Date of Download
    f. Date From MCP
    g. Date in File Name
    h. Names of Operating Crew
    i. Sent for SOP Monitoring
    j. Form Received
    k. Comments
    l. Action Taken
7. Out of these, numbers a, b and d need to be filled according to what was heard on the CVR recordings.
8. Numbers c, f and h need to be filled from the Movement Control Software or the "Rostering Software".
9. Once the CVR Log has been updated, an email confirming the receipt of CVR by Safety Department is sent by the FDAP Analyst to the Station in-charge (M&E) of the station from where it was uploaded (and other concerned personnel).

10. In case any observation regarding the quality of CVR recording is made, the same is intimated to MCC for further maintenance.

8.2.2 DFDR Download and Integrity Check

1. DFDRs are uploaded in the folder of the station from where it was downloaded from the aircraft on the SharePoint/s FTP Server.
2. FDM Analyst then copies these files and places the DFDR file for each aircraft registration in the folder for that registration in the "FDR" folder of the Back-up Drive. DFDRs are maintained in the Back-up Drive for a minimum period of five years.
3. The files downloaded on a particular day are then analyzed using the software "Safety Insight" as applicable.
4. Standard parameters are monitored for their recorded values. The FDAP software (Safety Insight) used has inbuilt capacity of checking synchronization and integrity of data, and provide reports for the same. Also, at the time of event analysis the integrity of recorded parameters is checked.
5. Once the integrity of the equipment is ascertained, the "FDR Data" log needs to be updated. This is an Excel workbook with different worksheets for each year.
6. The following details are to be updated in the Log as per the last leg of flights available in the FDR data:
    a. Aircraft Registration
    b. Download Date
    c. Flight Date
    d. Sector
    e. Station from where the DFDR was uploaded.
7. Out of these, a, b, c, and d need to be filled as per the data from the analysis software.
8. After the DFDR Log is filled, an email confirming the receipt of FDR by Safety Department is sent by the FDM Analyst to the Station in charge of the station from where it was uploaded (and other concerned personnel).
9. If any abnormalities are observed in the received data (for e.g. corrupt data, certain parameters not recorded properly etc.), the matter is escalated to engineering via email by the FDAP-Analyst.

8.3 CVR/DFDR DOWNLOAD AND INTEGRITY CHECK

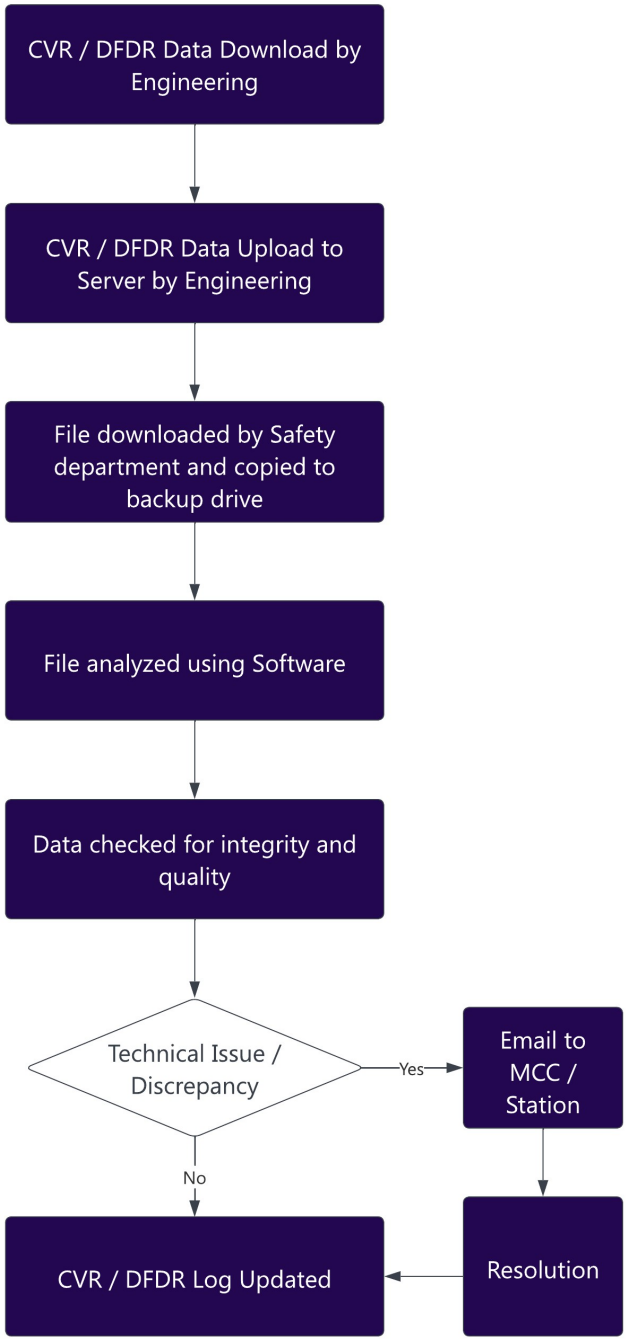

Figure 4 CVR/DFDR Download and Integrity Check

9 CONTINUOUS IMPROVEMENT

1. The continuous assessment of FDAP program includes technical and operational aspects.
2. The goals of FDA program are achieved through improvement in safety trends.
3. The FDAP parameter lists are updated with recommendation from GACA and done as per laid down in this Manual/SMS Manual.
4. The quality checks performed daily ensures the quality of processed flight data is maintained as per standards across fleet.
5. Continuous liaison with OEMs with respect to software and hardware issues and evolution for products.
6. The reduction in quality of database management and reliability of hardware are continuously actioned with help of Engineering and OEM for continuous improvement of the Program.
7. The FDM processes are audited during internal safety audit/external audits to identify deviation from processes and suggest areas of improvement.
8. Through conferences of OEMs the best practices and latest developments in technology are shared for knowledge sharing and improvement in technology.

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10 APPENDIX

10.1 EVENT LIST B787

Click to Access Event List

10.2 GE EVENT SUMMARY

10.2.1 List of the Events under Speed Category

10.2.2 List of the Events under Attitude/Pitch Category

10.2.3 List of the Events under Flight Path Category

10.2.4 List of the Events under Acceleration Category

10.2.5 List of the Events under Configuration Category

10.2.6 List of the Events under Power Category

10.2.7 List of the Events under Warning Category

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RIYADH AIR
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Event Type	Event Comments	Criteria	Caution Threshold	Warning Threshold	Other Conditions	ICAO Occurence Category
Brake Application during Takeoff	This event indicates the main wheel brake(s) were applied during the takeoff roll. Flight safety concerns with brake application during takeoff include an inability or difficulty to rotate at the proper airspeed, increased runway length required to become airborne, and/or increased brake temperatures which may affect stopping distances in cases where an RTO could be required. The default event thresholds trigger as follows: Caution: Brake Pressure Exceeds 100 PSI for 2 seconds Warning: Brake Pressure Exceeds 250 PSI Alert: Brake Pressure Exceeds 1000 PSI and the aircraft's velocity is greater than 80 knots for 2 seconds If the aircraft does not record brake pressure but does record brake pedal, the default event thresholds will be: Caution: Brake Pedal Exceeds 15 deg for 2 seconds Warning: Brake Pedal Exceeds 25 deg Alert: Brake Pedal Exceeds 50 deg and the aircraft's velocity is greater than 80 knots for 2 seconds	Brake Application Severity Level	Equal To 1 for 2 seconds after a point in time.	Equal To 2	Aircraft is Moving or Parking Brake Set is True Count of Brake Pressure Toggles during Takeoff < 3 is True Count of Brake Pedal Toggles during Takeoff < 5 is True Correlation Between Brake Pressure Left and Right > 0.5 is True Brake Pressure Looks Reasonable during Airborne is True	RE
Cabin Pressure Warning	This event indicates that the cabin pressure warning (indicating a low air pressure in the passenger cabin) is active. If the cabin pressure warning is not recorded, this event can be triggered based on the cabin altitude/cabin pressure parameter. The flight safety concerns include the possible disorientation or loss of consciousness by crew and passengers. If "Master Warning" is recorded, the event definition requires confirmation by a simultaneous "Master Warning" indication. This reduces the false-positive rate due to spurious values in "Cabin Pressure Warning". Required flight parameter: "Cabin Pressure Warning" OR "Cabin Altitude"	Cabin Pressure Warning or High Cabin Altitude		Greater Than 0.5 for 2 seconds after a point in time.	Master Warning (if recorded) is True	SCF-NP
Engine Fire (left inboard engine)	This event indicates that a fire has been detected in the left inboard engine. The flight safety concerns include structural integrity of the airplane as well as the ability to maintain control and speed. If "Master Warning" is recorded, the event definition requires confirmation by a simultaneous "Master Warning" indication. This reduces the false-positive rate due to spurious values in "Fire (left inboard engine; fire if > 0.5)". Required flight parameter: "Fire (left inboard engine; fire if > 0.5)"	Fire (left inbd eng)		Greater Than 0.5 for 2 seconds after a point in time.	Master Warning (if recorded) is True Fuel Flow to Left Inboard Engine is Greater Than 50	F-NI
Engine Fire (right inboard engine)	This event indicates that a fire has been detected in the right inboard engine. The flight safety concerns include structural integrity of the airplane as well as the ability to maintain control and speed. If "Master Warning" is recorded, the event definition requires confirmation by a simultaneous "Master Warning" indication. This reduces the false-positive rate due to spurious values in "Fire (right inboard engine; fire if > 0.5)". Required flight parameter: "Fire (right inboard engine; fire if > 0.5)"	Fire (right inbd eng)		Greater Than 0.5 for 2 seconds after a point in time.	Master Warning (if recorded) is True Fuel Flow to Right Inboard Engine is Greater Than 50	F-NI
Engine Stall or Surge In-Flight: Left Inboard Engine	This event indicates a possible stall or surge in the left inboard engine as indicated by either an "engine surge" parameter or an increase in EGT that is not accompanied by a corresponding increase in fuel flow. The flight safety concerns include loss of thrust, loss of control, and damage to the engine.	Surge Detected or EGT Increased by 20% in last 2 seconds		True	Percent Increase in Fuel Flow to the Left Inboard Engine is Less Than 5 for 5 seconds before a point in time. Relative difference between EGT (left inbd) and next highest EGT is Greater Than 20	SCF-PP
Engine Stall or Surge In-Flight: Right Inboard Engine	This event indicates a possible stall or surge in the right inboard engine as indicated by either an "engine surge" parameter or an increase in EGT that is not accompanied by a corresponding increase in fuel flow. The flight safety concerns include loss of thrust, loss of control, and damage to the engine.	Surge Detected or EGT Increased by 20% in last 2 seconds		True	Percent Increase in Fuel Flow to the Right Inboard Engine is Less Than 5 for 5 seconds before a point in time. Relative difference between EGT (right inbd) and next highest EGT is Greater Than 20	SCF-PP

Excess Ground Speed: Taxi In	This event indicates that an unusually high ground speed occurred during taxi in. It will be suppressed if the aircraft is entering, occupying, or leaving a runway, as higher speeds are generally acceptable in these cases. Required flight parameters: "Ground Speed" Associated Measurement: "Maximum Ground Speed during Taxi In"	Ground Speed (inertial or only)	Between (inclusive) 35 and 100 for 2 seconds after a point in time.	Between (inclusive) 50 and 100 for 2 seconds after a point in time.	Prob w/in 250 ft of nearest runway is Less Than 75 from 10 before to 10 seconds after a point in time.	GCOL
Excess Ground Speed: Taxi Out	This event indicates that an unusually high ground speed occurred during taxi out. It will be suppressed if the aircraft is entering, occupying, or leaving a runway, as higher speeds are generally acceptable in these cases. Required flight parameters: "Ground Speed" Associated Measurement: "Maximum Ground Speed during Taxi Out"	Ground Speed (inertial or only)	Between (inclusive) 35 and 100 for 2 seconds after a point in time.	Between (inclusive) 50 and 100 for 2 seconds after a point in time.	Prob w/in 250 ft of nearest runway is Less Than 75 from 10 before to 10 seconds after a point in time.	GCOL
GPWS: Don't Sink	This event indicates that a Ground Proximity Warning System (GPWS) aural alert ("Don't Sink") is active. This alert occurs when there is a significant altitude loss after takeoff. This event also requires that the radio height be less than 3000 ft. This condition reduces the rate of false events due to spurious values in the "GPWS: Don't Sink" data. If the "GPWS: Don't Sink" parameter is not recorded but GPWS mode emulation is active (can be configured with a fleet constant), indications from the "GPWS Alert (type unspecified)" parameter may cause this event. If the unspecified alert is active while the emulated Mode 3 "Don't Sink" envelope is violated, this event will fire. The flight safety concerns include the possibility of a collision with an obstacle or terrain. Required flight parameters: "GPWS: Don't Sink", "Radio Altitude" .	GPWS: Don't Sink or Unspecified with Don't Sink Envelope Violation	Greater Than 0.5	Greater Than 0.5 for 5 seconds after a point in time.	Best Estimate of Main Gear Height AGL is Between (inclusive) 5 and 3000	CFIT
GPWS: Glideslope	This event indicates that a Ground Proximity Warning System (GPWS) aural alert ("Glideslope") is active. This alert occurs when the airplane descends below the ILS glide path. This event also requires that the radio height be less than 3000 ft. This conditions reduces the rate of false events due to spurious values in the "GPWS: Glideslope" data. If the "GPWS: Glideslope" parameter is not recorded but GPWS mode emulation is active (can be configured with a fleet constant), indications from the "GPWS Alert (type unspecified)" parameter may cause this event. If the unspecified alert is active while the emulated Mode 5 "Glideslope" envelope is violated, this event will fire. The flight safety concerns include the possibility of collision with an obstacle or terrain prior to reaching the runway threshold during final approach. Required flight parameters: "GPWS: Glideslope" OR "GPWS Alert (type unspecified)", "Radio Altitude" .	GPWS: Glideslope or Unspecified with Glideslope Envelope Violation			Best Estimate of Main Gear Height AGL is Between (inclusive) 5 and 3000	CFIT
GPWS: Look Ahead Caution	This event indicates that a Ground Proximity Warning System (GPWS) look-ahead aural caution level alert ("Caution Terrain". "Terrain Ahead", Caution Obstacle", "Obstacle Ahead") is active. This alert occurs when the future projected location of the aircraft is sufficiently low or near obstacles. This event uses a number of possible recorded parameters to trigger the event and filters out alerts that are unrealistically long, occur below 50ft AGL, or is not projected to a low future AGL. The flight safety concerns include the possibility of a ground collision. Required flight parameters: "Caution Terrain", "Terrain Ahead", "Obstacle Ahead", "Terrain Caution", "Obstacle Caution" or "Terrain/Obstacle Caution"	Look Ahead Caution Alert	Greater Than 0.5	Greater Than 0.5 for 5 seconds after a point in time.		CFIT
GPWS: Look Ahead Warning	This event indicates that a Ground Proximity Warning System (GPWS) look-ahead aural warning level alert ("Terrain Ahead Pull Up". "Obstacle Ahead Pull Up", "Terrain, Terrain Pull Up", "Obstacle, Obstacle Pull Up") is active. This alert occurs when the future projected location of the aircraft is sufficiently low or near obstacles. This event uses a number of possible recorded parameters to trigger the event and filters out alerts that are unrealistically long, occur below 50ft AGL, or is not projected to a low future AGL. The flight safety concerns include the possibility of a ground collision. Required flight parameters: "Terrain Ahead Pull Up", "Obstacle Ahead Pull Up", "Terrain Warning", "Obstacle Warning", "Terrain/Obstacle Warning"	Look Ahead Warning Alert	Greater Than 0.5	Greater Than 0.5 for 5 seconds after a point in time.		CFIT
GPWS: Pull Up	This event indicates that a Ground Proximity Warning System (GPWS) aural alert ("Whoop Whoop Pull Up") is active. This alert occurs when the rate of descent is very high for the current radio height. This event also requires that the radio height be less than 3000 ft, and that the airplane is descending at a rate of at least 200 ft/minute. These conditions reduce the rate of false events due to spurious values in the "GPWS: Pull Up" data. The flight safety concerns include the possibility of a ground collision. Required flight parameters: "GPWS: Pull Up", "Radio Altitude", "Vertical Speed (inertial)" OR "Pressure Altitude"	GPWS: Pull Up	Greater Than 0.5	Greater Than 0.5 for 5 seconds after a point in time.	Best Estimate of Main Gear Height AGL is Between (inclusive) 5 and 3000 Vertical Speed (best avail) is Less Than -200	CFIT

GPWS: Sink Rate	This event indicates that a Ground Proximity Warning System (GPWS) aural alert ("Sink Rate") is active. This alert occurs when the rate of descent is high for the current radio height. This event also requires that the radio height be less than 3000 ft, and that the airplane is descending at a rate of at least 200 ft/minute. These conditions reduce the rate of false events due to spurious values in the "GPWS: Sink Rate" data. If the "GPWS: Sink Rate" parameter is not recorded but GPWS mode emulation is active (can be configured with a fleet constant), indications from the "GPWS Alert (type unspecified)" parameter may cause this event. If the unspecified alert is active while the emulated Mode 1 "Sinkrate" envelope is violated, this event will fire. The flight safety concerns include the possibility of a ground collision. Required flight parameters: "GPWS: Sink Rate" OR "GPWS Alert (type unspecified)", "Radio Altitude", "Vertical Speed (inertial)" OR "Pressure Altitude"	GPWS: Sink Rate or Unspecified with Sinkrate Envelope Violation	Greater Than 0.5	Greater Than 0.5 for 5 seconds after a point in time.	Best Estimate of Main Gear Height AGL is Between (inclusive) 5 and 3000 Vertical Speed (best avail) is Less Than -200	CFIT
GPWS: Terrain	This event indicates that a Ground Proximity Warning System (GPWS) aural alert ("Terrain Terrain") is active. This alert occurs when the terrain closure rate is high for the current radio height. This event also requires that the radio height be less than 3000 ft. This condition reduces the rate of false events due to spurious values in the "GPWS: Terrain" data. If the "GPWS: Terrain" parameter is not recorded but GPWS mode emulation is active (can be configured with a fleet constant), indications from the "GPWS Alert (type unspecified)" parameter may cause this event. If the unspecified alert is active while the emulated Mode 2 "Terrain" envelope is violated, this event will fire. The flight safety concerns include the possibility of a ground collision. Required flight parameters: "GPWS: Terrain" OR "GPWS Alert (type unspecified)", "Radio Altitude" .	GPWS: Terrain or Unspecified with Terrain Envelope Violation	Greater Than 0.5	Greater Than 0.5 for 5 seconds after a point in time.	Best Estimate of Main Gear Height AGL is Between (inclusive) 5 and 3000	CFIT
GPWS: Terrain Pull Up	This event indicates that a Ground Proximity Warning System (GPWS) aural alert ("Whoop Whoop Pull Up") is active. This alert occurs when the terrain closure rate is very high for the current radio height. This event also requires that the radio height be less than 3000 ft. This condition reduces the rate of false events due to spurious values in the "GPWS: Terrain Pull Up" data. The flight safety concerns include the possibility of a ground collision. Required flight parameters: "GPWS: Terrain Pull Up", "Radio Altitude" .	GPWS: Terrain Pull Up	Greater Than 0.5	Greater Than 0.5 for 5 seconds after a point in time.	Best Estimate of Main Gear Height AGL is Between (inclusive) 5 and 3000	CFIT
GPWS: Too Low Flap	This event indicates that a Ground Proximity Warning System (GPWS) aural alert ("Too Low Flaps") is active. This alert occurs when the airplane descends to a low radio height with the flaps not in the landing configuration. This event also requires that the radio height be less than 3000 ft and the airplane be descending. These conditions reduce the rate of false events due to spurious values in the "GPWS: Too Low Flaps" data. If the "GPWS: Too Low Flap" parameter is not recorded but GPWS mode emulation is active (can be configured with a fleet constant), indications from the "GPWS Alert (type unspecified)" parameter may cause this event. If the unspecified alert is active while the emulated Mode 4 "Too Low Flap" envelope is violated, this event will fire. The flight safety concerns include the possibility of a runway overrun. Required flight parameters: "GPWS: Too Low Flaps" OR "GPWS Alert (type unspecified)", "Radio Altitude", " Vertical Speed (inertial)" OR "Pressure Altitude" .	GPWS: Too Low Flap or Unspecified with Too Low Flap Envelope Violation	Greater Than 0.5	Greater Than 0.5 for 5 seconds after a point in time.	Vertical Speed (best avail) is Less Than 0 for 5 seconds after a point in time. Best Estimate of Main Gear Height AGL is Between (inclusive) 5 and 3000	CFIT
GPWS: Too Low Gear	This event indicates that a Ground Proximity Warning System (GPWS) aural alert ("Too Low Gear") is active. This alert occurs when the airplane descends to a low radio height with the gear still up. This event also requires that the radio height be less than 3000 ft and the airplane be descending. These conditions reduce the rate of false events due to spurious values in the "GPWS: Too Low Gear" data. If the "GPWS: Too Low Gear" parameter is not recorded but GPWS mode emulation is active (can be configured with a fleet constant), indications from the "GPWS Alert (type unspecified)" parameter may cause this event. If the unspecified alert is active while the emulated Mode 4 "Too Low Gear" envelope is violated, this event will fire. The flight safety concerns include the possibility of a ground collision or a gear-up landing. Required flight parameters: "GPWS: Too Low Gear" OR "GPWS Alert (type unspecified)", "Radio Altitude", " Vertical Speed (inertial)" OR "Pressure Altitude" .	GPWS: Too Low Gear or Unspecified with Too Low Gear Envelope Violation	Greater Than 0.5	Greater Than 0.5 for 5 seconds after a point in time.	Vertical Speed (best avail) is Less Than 0 for 5 seconds after a point in time. Best Estimate of Main Gear Height AGL is Between (inclusive) 5 and 3000	CFIT
GPWS: Too Low Terrain	This event indicates that a Ground Proximity Warning System (GPWS) aural alert ("Too Low Terrain") is active. This alert occurs when there is insufficient terrain clearance for a given phase of flight and speed. This event also requires that the radio height be less than 3000 ft. This condition reduces the rate of false events due to spurious values in the "GPWS: Too Low Terrain" data. If the "GPWS: Too Low Terrain" parameter is not recorded but GPWS mode emulation is active (can be configured with a fleet constant), indications from the "GPWS Alert (type unspecified)" parameter may cause this event. If the unspecified alert is active while the emulated Mode 4 "Too Low Terrain" envelope or TCF (Terrain Clearance Floor) is violated, this event will fire. The flight safety concerns include the possibility of a ground collision. Required flight parameters: "GPWS: Too Low Terrain" OR "GPWS Alert (type unspecified)", "Radio Altitude" .	GPWS: Too Low Terrain or Unspecified with Too Low Terrain Envelope Violation	Greater Than 0.5	Greater Than 0.5 for 5 seconds after a point in time.	Best Estimate of Main Gear Height AGL is Between (inclusive) 5 and 3000	CFIT
Hard Landing (Acceleration Method)	This event indicates that a higher than normal load factor was detected during landing. The caution and warning thresholds for this event are based upon the pitch and roll of the aircraft at the time of maximum load factor. Landings that occur on the nose wheel or a single main gear have lower maximum load factor thresholds when compared to landings that occur on both main gear with the wings level at the proper touchdown pitch attitude.	Hard Landing Severity	Greater Than or Equal To 2	Greater Than or Equal To 3	Evaluate Landing is Equal To True	ARC

High Bank Angle for this Height	This event indicates that the airplane is at an unusually large bank angle for this height above the ground. The flight safety concerns include a degraded ability to pull up in a ground collision avoidance situation. Required flight parameters: "Roll Attitude (Captain's or Only)" "Pressure Altitude", "Radio Altitude (fine)" Associated Measurement: "Maximum Exceedance of Bank Angle Limit"	Bank Angle Limit Exceedance	Between (inclusive) 0 and 90 for Duration Required for Bank Angle Exceedance seconds after a point in time.	Between (inclusive) 5 and 90 for Duration Required for Bank Angle Exceedance seconds after a point in time.		LOC-I
High Pitch Angle for this Height	This event indicates that the airplane is at an unusually high pitch angle for this height above the ground. The flight safety concerns include loss of airspeed or stall.	Upper Pitch Limit Exceedance	Equal To 1	Equal To 2		LOC-I
Hot Start Detected (left inbd eng)	This event triggers if the left inboard engine experiences difficulty during starting with sub-optimal airflow which generally results from an excessively rich fuel/air mixture entering the combustion chamber. During this period, airflow through the engine may be insufficient to ensure proper cooling which may be the result of early starter cut-out, fuel scheduling errors, or strong tailwinds during the start sequence.	FADEC Advised Hot Start (left inbd eng)		Equal To 1	N2 (left inbd eng) is Greater Than 10 from 2 before to 2 seconds after a point in time. N2 (left inbd eng) is Less Than 50 from -5 before to 10 seconds after a point in time.	SCF-PP
Hot Start Detected (right inbd eng)	This event triggers if the right inboard engine experiences difficulty during starting with sub-optimal airflow which generally results from an excessively rich fuel/air mixture entering the combustion chamber. During this period, airflow through the engine may be insufficient to ensure proper cooling which may be the result of early starter cut-out, fuel scheduling errors, or strong tailwinds during the start sequence.	FADEC Advised Hot Start (right inbd eng)		Equal To 1	N2 (right inbd eng) is Greater Than 10 from 2 before to 2 seconds after a point in time. N2 (right inbd eng) is Less Than 50 from -5 before to 10 seconds after a point in time.	SCF-PP
Hung Start Detected (left inbd eng)	This event triggers if the left inboard engine starts, but the RPM remains at a low value rather than increasing to the normal starting RPM. This may be the result of the starter cutting off before the engine starts self-accelerating.	FADEC Advised Hung Start (left inbd eng)		Equal To 1	N2 (left inbd eng) is Greater Than or Equal To 10 from 2 before to 2 seconds after a point in time.	SCF-PP
Hung Start Detected (right inbd eng)	This event triggers if the right inboard engine starts, but the RPM remains at a low value rather than increasing to the normal starting RPM. This may be the result of the starter cutting off before the engine starts self-accelerating.	FADEC Advised Hung Start (right inbd eng)		Equal To 1	N2 (right inbd eng) is Greater Than 10 from 2 before to 2 seconds after a point in time.	SCF-PP
Ice Crystal Build Up on Engine TAT (left inbd)	This event looks for TAT sensor values near 0 when we expect the true TAT to be more than 10 degrees away from 0. This anomaly may indicate Ice Crystal Build Up on the TAT probe and other susceptible areas of the aircraft.	Abs value of Best TAT	Greater Than 10 for 10 seconds after a point in time.		abs([Compressor Inlet Total Temperature (left inbd eng) (deg C)]) is Less Than 1 for 10 seconds after a point in time.	ICE
Ice Crystal Build Up on Engine TAT (right inbd)	This event looks for TAT sensor values near 0 when we expect the true TAT to be more than 10 degrees away from 0. This anomaly may indicate Ice Crystal Build Up on the TAT probe and other susceptible areas of the aircraft.	Abs value of Best TAT	Greater Than 10 for 10 seconds after a point in time.		abs([Compressor Inlet Total Temperature (right inbd eng) (deg C)]) is Less Than 1 for 10 seconds after a point in time.	ICE
Ice Crystal Build Up on Fuselage TAT 2	This event looks for TAT sensor values near 0 when we expect the true TAT to be more than 10 degrees away from 0. This anomaly may indicate Ice Crystal Build Up on the TAT probe and other susceptible areas of the aircraft.	Abs value of Best TAT	Greater Than 10 for 10 seconds after a point in time.		abs([Air Temperature (total; ADC 2) (deg C)]) is Less Than 1 for 10 seconds after a point in time.	ICE
Incorrect Landing Altimeter Setting	This event indicates that the selected Altimeter Setting deviates from the reported Altimeter Setting from the matched METAR report for this landing. If the deviation from the reported value would result in a Baro-Corrected Altitude Error greater than a limit, the event is fired. The flight safety concerns include CFIT, Runway Excursion, and Midair Collision. Required flight parameters: "Altimeter Setting (1, Capt, or only) (hPa (mbar))" OR "Altimeter Setting (1, Capt, or only) (inHg)" OR "Altimeter Setting (2 or F/O) (hPa (mbar))" OR "Altimeter Setting (2 or F/O) (inHg)" . Associated Measurements: "Baro-Corrected Altitude (QNH) Error From Landing Altimeter Setting Error (ft)", "Captain's Altimeter Setting at Touchdown (inHg)", "First Officer's Altimeter Setting at Touchdown (inHg)", "Expected Altimeter Setting for Landing (inHg)".	Baro Altitude Error From Incorrect Altimeter Setting	Greater Than 75	Greater Than 100		CFIT
Incorrect Takeoff Altimeter Setting	This event indicates that the selected Altimeter Setting deviates from the reported Altimeter Setting from the matched METAR report for this takeoff. If the deviation from the reported value would result in a Baro-Corrected Altitude Error greater than a limit, the event is fired. The flight safety concerns include CFIT, Runway Excursion, and Midair Collision. Required flight parameters: "Altimeter Setting (1, Capt, or only) (hPa (mbar))" OR "Altimeter Setting (1, Capt, or only) (inHg)" OR "Altimeter Setting (2 or F/O) (hPa (mbar))" OR "Altimeter Setting (2 or F/O) (inHg)" . Associated Measurements: "Baro-Corrected Altitude (QNH) Error From Takeoff Altimeter Setting Error (ft)", "Captain's Altimeter Setting at Takeoff (inHg)", "First Officer's Altimeter Setting at Takeoff (inHg)", "Expected Altimeter Setting for Takeoff (inHg)".	Baro Altitude Error From Incorrect Altimeter Setting	Greater Than 75	Greater Than 100		CFIT

Landing Weight Limit Exceedance	This event indicates that the gross weight at touchdown exceeded the maximum landing weight recommended for this fleet. This may warrant a maintenance inspection. Required flight parameters: "Gross Weight (lbs)" OR "Gross Weight (kg) OR "Gross Weight (metric tons)" . Required flight constants: "Gross Weight Maximum (landing; lbs)" OR "Gross Weight Maximum (landing; metric tons)" . Associated Measurements: "Percentage of Maximum Landing Weight at Touchdown", "Gross Weight at Touchdown (1000 lbs)", "Gross Weight at Touchdown (metric tons)" .	Percentage of Maximum Landing Weight at Touchdown	Between (inclusive) 105 and 150	Between (inclusive) Landing Weight Limit Exceedance (Warning Threshold) and 150		LIM-A
Low Buffet Speed at High Altitude	This event will trigger if the calibrated airspeed (airspeed displayed on the flight deck) is equal to or less than the low buffet speed. The low buffet speed is recorded from the aircraft (preferred method) or derived from a table using gross weight and altitude.	Calibrated Airspeed - Low Buffet Speed Limit	Between (inclusive) -30 and -2 for 3 seconds after a point in time.	Between (inclusive) -30 and -5 for 3 seconds after a point in time.	Baro-Corrected Altitude is Greater Than 26000	LOC-I
Low Hydraulic Pressure	This event indicates that at least one hydraulic system has lost pressure. The flight safety concerns include a possible loss of control if more systems fail. Required flight parameters: "Hydraulic Pressure Low (system A, 1, left, or blue)" OR "Hydraulic Pressure Low (system B, 2, center, or green)" OR "Hydraulic Pressure Low (system C, 3, right, or yellow)" OR "Hydraulic Pressure Low (system D or 4)" OR "Hydraulic Pressure (system A, 1, or left)" OR "Hydraulic Pressure (system B, 2, or center)" OR "Hydraulic Pressure (system C, 3, or right)" OR "Hydraulic Pressure (system D or 4)" Associated Measurement: "Minimum Hydraulic Pressure of Any System during Flight"	Low Hydraulic Pressure	True for 2 seconds after a point in time.	True for 10 seconds after a point in time.	Master Caution or Warning (if both recorded) is True	SCF-NP
Low Pitch Angle for this Height	This event indicates that the airplane is at an unusually low pitch angle for this height above the ground. The flight safety concerns include large increases in airspeed and sink rate.	Lower Pitch Limit Exceedance	Equal To 1	Equal To 2		LOC-I
Lower Maneuvering Load Limit Exceeded (Flaps Down)	This event indicates that the minimum normal load-factor (the apparent acceleration in the body "up" direction), that occurred while airborne with the flaps extended, exceeded the lower structural or maneuvering limit for this fleet. Required flight parameter: "Acceleration (normal load-factor)" Required flight constant: "Normal Load-Factor Minimum (Flaps Down)" Associated measurement: "Minimum Normal Load-Factor while Airborne with the Flaps Down"	Minimum Normal Load-Factor while Airborne with the Flaps Down		Less Than 0		LIM-A
Lower Maneuvering Load Limit Exceeded (Flaps Up)	This event indicates that the minimum normal load-factor (the apparent acceleration in the body "up" direction), that occurred while airborne with the flaps retracted, exceeded the lower structural or maneuvering limit for this fleet. Required flight parameter: "Acceleration (normal load-factor)" Required flight constant: "Normal Load-Factor Minimum (Flaps Up)" Associated measurement: "Minimum Normal Load-Factor while Airborne with the Flaps Up"	Minimum Normal Load-Factor while Airborne with the Flaps Up		Less Than -1		LIM-A
Low-Level Windshear	This event indicates that windshear was detected while flying within 2000 ft of the ground. The flight safety concerns are possible loss of flight path or speed control or stall, resulting in ground collision or runway overrun.	Wind Shear (1 = caution, 2 = warning)	Greater Than or Equal To 1 for 2 seconds after a point in time.	Equal To 2 for 2 seconds after a point in time.	Best Estimate of Main Gear Height AGL is Between (inclusive) 50 and 2000 Height AFE is Less Than 2000	WSTRW

MMO Exceedance	This event indicates that the maximum operating Mach number for this airplane type has been exceeded. This Mach number limit is abbreviated MMO for Mach_Maximum_Operating. Possible flight safety concerns include buffeting, "tuck under" (an uncommanded pitch motion), and loss of control. Required flight parameter: "Mach Number" Required flight constant: "MMO" Associated Measurement: "MMO: Maximum Exceedance"	MMO Exceedance	Between (inclusive) 0.01 and 0.25 for 2 seconds after a point in time.	Between (inclusive) 0.02 and 0.25 for 2 seconds after a point in time.		LIM-A
No Fuel Flow to Left Inboard Engine	This event indicates that fuel is not flowing to the left inboard engine while airborne or during takeoff or landing. Note that this event does not try to determine whether or not this is in response to action by the crew. The flight safety concern is simply that this engine will no longer contribute to the thrust required to maintain speed, lift, and control of the airplane. Required flight parameters: "Fuel Flow (left inboard engine; lbs/hr)" OR "Fuel Flow (left inboard engine; kg/hr)"	Fuel Flow has been Cut Off from Left Inboard Engine		True for 10 seconds after a point in time.	Engine Fuel Flow Total is Greater Than 100 for 10 seconds after a point in time.	FUEL
No Fuel Flow to Right Inboard Engine	This event indicates that fuel is not flowing to the right inboard engine while airborne or during takeoff or landing. Note that this event does not try to determine whether or not this is in response to action by the crew. The flight safety concern is simply that this engine will no longer contribute to the thrust required to maintain speed, lift, and control of the airplane. Required flight parameters: "Fuel Flow (right inboard engine; lbs/hr)" OR "Fuel Flow (right inboard engine; kg/hr)"	Fuel Flow has been Cut Off from Right Inboard Engine		True for 10 seconds after a point in time.	Engine Fuel Flow Total is Greater Than 100 for 10 seconds after a point in time.	FUEL
Not in Takeoff Configuration	This event indicates that the airplane is not properly configured for the takeoff that is in progress. Specifically, this event checks flaps, slats, and speed brakes in addition to takeoff configuration warnings. Required flight parameters: "Flap T/O Configuration Warning" OR "Flap Position (+=TED)" OR "Flap Handle Position" OR "Slats Retracted (true if < 0.5)" OR "Slat Position (+=LED)" OR "Spoiler T/O Configuration Warning" OR "Speed Brake Handle" OR "Speed Brake Position (+=TEU)" OR "Speed Brakes Deployed" "Stabilizer T/O Configuration Warning" OR "Body Gear Steering T/O Configuration Warning" OR "Parking Brake T/O Configuration Warning" OR "Parking Brake" Optional flight constants: "Flap Handle Position Minimum for Takeoff" OR "Flap Handle Position Maximum for Takeoff" OR "Slat Position Minimum for Takeoff" OR "Flap Position Minimum for Takeoff" Associated Measurements: "Flap Handle at Liftoff", "Flap Position at Liftoff", "Slat Position at Liftoff" "Horizontal Stabilizer Position at Liftoff" .	In Takeoff Configuration		False for 2 seconds before a point in time.	Airspeed (calibrated; 1 or Only) is Greater Than 80	RE
Passenger Comfort Limits Exceeded	This event was created to identify large accelerations that may result in injury or discomfort to passengers. This is done by determining how far the "apparent gravity" inside the airplane has deviated from 1 g pointed downward. This deviation is a vector whose magnitude is compared with constant trigger levels in g's. The event is active at all times from the start of taxi out until the end of taxi in (i.e. whenever passengers are present and accelerations may occur due to motion of the airplane). Required flight parameters: "Acceleration (longitudinal)" OR "Acceleration (lateral)" OR "Acceleration (normal load-factor)" Associated Measurement: "Magnitude of Max Departure from 1g Apparent Gravity"	Magnitude of Departure from 1 g apparent gravity	Between (inclusive) 0.7 and 2 for 0.5 seconds after a point in time.	Between (inclusive) 0.8 and 2 for 0.5 seconds after a point in time.		TURB

Pitch High on Landing	This event indicates that the maximum pitch during landing (or near-ground go-around) exceeded the maximum recommended for this fleet. The flight safety concerns include a possible tail strike. Required flight parameters: Pitch Attitude (Captain's or Only) Required flight constants: "Pitch Limit with main Gear Compressed" Associated Measurements: "Maximum Pitch below 35 ft AGL during last approach"	pitch (% of limit)	Greater Than 85	Greater Than 90	Evaluate Landing is True	ARC
Pitch High on Takeoff	This event indicates that the maximum pitch during the takeoff exceeded the maximum recommended for this fleet. The flight safety concerns include a possible tail strike. Required flight parameters: "Pitch Attitude (Captain's or Only)" Required flight constants: "Pitch Limit with Main Gear Extended" Associated Measurements: "Maximum Pitch during Takeoff Tailstrike Test Interval" .	Maximum Pitch during Tailstrike test interval (% of limit)	Greater Than 82	Greater Than 85		ARC
Predictive Windshear	This event triggers when the predictive windhear system (PWS) indicates an alert (Advisory, Caution or Warning). The predictive windshear system uses radar to identify the existence of windshear. The flight safety concerns are possible loss of flight path or speed control, resulting in ground collision or runway overrun. Required flight parameter: "Predictive Windshear"	Predictive Windshear	Greater Than 1.5 for 1 seconds after a point in time.	Greater Than 2.5 for 1 seconds after a point in time.		WSTRW
Risk of Going Off Side of Runway during Roll Out	This event indicates that the airplane either touched down or veered to one side of the runway centerline during roll out (not centered). The flight safety concerns include the possibility of leaving the runway before the end of roll out. Required flight parameter: "Localizer Deviation in Dots (1; only)" Associated Measurement: "Min Separation between Tire and Side Edge of Runway during Roll Out (ft) " .	Min Separation between Tire and Side Edge of Runway during Roll Out	Between (inclusive) 0 and 29	Between (inclusive) 0 and 17.5		RE
Risk of Landing Short of Runway	This event indicates that the runway length over flown before touchdown was a tad short. This distance is estimated from time histories of the glideslope deviation, recorded aircraft positions, and times of over flights of markers. The flight safety concerns include the possibility of sticking the landing gear in the mud or lights just short of the threshold. Associated Measurements: "Conservative Estimate of Distance from Start of Physical Rwy to Touchdown (ft)", "Conservative Estimate of Distance from Threshold to Touchdown (ft)", "Conservative Estimate of Distance from Start of Physical Rwy to Touchdown (m)", "Conservative Estimate of Distance from Threshold to Touchdown (m)" .	Conservative Estimate of Distance from Start of Physical Rwy to Touchdown	Between (inclusive) 0 and 608	Between (inclusive) 0 and 355		RE
Risk of Runway Incursion	This event detects emergency braking while approaching any runway during taxi.	Deceleration over 2 seconds	Between (inclusive) 0.15 and 0.7	Between (inclusive) 0.2 and 0.7	Taxi Phase of Flight is True Angle Difference with Rwy Centerline is Between (inclusive) 30 and 150 from 2 before to 3 seconds after a point in time. Min Ground Speed over next 5 seconds is Less Than or Equal To 3	RI
Risk of Runway Overrun during Landing	This event indicates that the current landing may involve an increased risk of a runway overrun. This is determined by calculating the minimum runway margin [Runway Remaining - Runway Required], expressed as a percent of runway remaining, for each sample point during the roll out. The runway required assumes that the static coefficient of friction is equal to the expected value for the the current runway condition, and takes into account the contribution of all deceleration devices, including thrust reverse, drag, braking, and gravity.	Minimum Runway Margin during Roll Out (% of runway remaining)	Less Than 48	Less Than 44		RE
Risk of Runway Overrun during RTO	This event indicates that the current rejected takeoff may involve an increased risk of a runway overrun. This is determined by calculating the minimum runway margin [Runway Remaining - Runway Required], expressed as a percent of runway remaining, for each sample point during the RTO. The runway required assumes that the static coefficient of friction is equal to the expected value for the the current runway condition, and takes into account the contribution of all deceleration devices, including thrust reverse, drag, braking, and gravity.	Minimum Runway Margin during RTO (% of runway remaining) (%)	Less Than 48	Less Than 44		RE
Risk of Runway Overrun during Takeoff	This event is designed to indicate that the aircraft was at increased risk of failing to get airborne before reaching the end of the runway overrun. It is based upon the distance used to reach Vmu (minimum unstick speed), divided by the takeoff distance available and in front of the aircraft at the start of the takeoff run.	Portion of Available Takeoff Distance Required to Achieve Liftoff	Greater Than 70	Greater Than 75		RE

Risk of Tail Strike during Landing	This event indicates that the minimum clearance below the tail skid during the landing was unusually small. The flight safety concerns include a possible tail strike. Required flight parameters: "Tail Clearance" OR ("Radio Altitude (fine)" AND "Pitch Attitude (Captain's or Only)") . Required flight constants: "Radar Altimeter Bias", "Distance from RALT to Tail Skid (longitudinal)" "Distance from RALT to Tail Skid (normal)" Associated Measurement: "Minimum Tail Clearance during Landing"	Minimum Tail Clearance during Landing	Less Than 1	Less Than 0		ARC
Risk of Tail Strike during Takeoff	This event indicates that the minimum clearance below the tail skid during the takeoff rotation was unusually small. The flight safety concerns include a possible tail strike. Required flight parameters: "Tail Clearance" OR ("Radio Altitude (fine)" AND "Pitch Attitude (Captain's or Only)") . Required flight constants: "Radar Altimeter Bias", "Distance from RALT to Tail Skid (longitudinal)" "Distance from RALT to Tail Skid (normal)" Associated Measurement: "Minimum Tail Clearance during Takeoff"	Minimum Tail Clearance during Takeoff	Less Than 1	Less Than 0		ARC
Risk of Wing or Pod Strike during Landing	This event indicates that the maximum roll attitude (bank angle) below 50 ft during landing was unusually large. The flight safety concerns include a possible wing or engine pod strike. Required flight parameters: "Roll Attitude (Captain's or Only)", "Roll Limit for Takeoff and Landing" . Associated Measurement: "Minimum Roll Margin during Landing" .	Minimum Roll Margin during Landing	Less Than 5	Less Than 1		ARC
Smoke Warning (Avionics Bay)	This event indicates that smoke has been detected in the avionics bay. If "Master Warning" is recorded, the event definition requires confirmation by a simultaneous "Master Warning" indication. This reduces the false-positive rate due to spurious values in "Smoke Warning (Avionics Bay)". Required flight parameter: "Smoke Warning (Avionics Bay)"	Smoke Warning (Avionics Bay)		True for 2 seconds after a point in time.	Master Warning (if recorded) is True	F-NI
Smoke Warning (Cargo)	This event indicates that smoke has been detected in the cargo compartment. If "Master Warning" is recorded, the event definition requires confirmation by a simultaneous "Master Warning" indication. This reduces the false-positive rate due to spurious values in "Smoke Warning (Cargo)". Required flight parameter: "Smoke Warning (Cargo)"	Smoke Warning (Main Cargo Hold)		True for 2 seconds after a point in time.	Master Warning (if recorded) is True	F-NI
Smoke Warning (General)	This event indicates that smoke has been detected onboard the airplane. If "Master Warning" is recorded, the event definition requires confirmation by a simultaneous "Master Warning" indication. This reduces the false-positive rate due to spurious values in "Smoke Warning (General)". Required flight parameter: "Smoke Warning (General)"	Smoke Warning (General)		True for 2 seconds after a point in time.	Master Warning (if recorded) is True	F-NI
Smoke Warning (Lavatory)	This event indicates that smoke has been detected in a lavatory. If "Master Warning" is recorded, the event definition requires confirmation by a simultaneous "Master Warning" indication. This reduces the false-positive rate due to spurious values in "Smoke Warning (Lavatory)". Required flight parameter: "Smoke Warning (Lavatory)"	Smoke Warning (Lavatory)		True for 2 seconds after a point in time.	Master Warning (if recorded) is True	F-NI

Stall Warning	This event indicates that a stall warning is currently active. The event severities are as follows: Warning = High Angle of Attack (estimated) or Low Airspeed (calibrated) Caution = Confirming Discrete or Response in Pitch (simultaneous master caution/warning, autopilot disconnect, large pitch) Information Only = unconfirmed stall warning for unknown reason See associated event-specific measurements for more information. Required flight parameter: "Stick Shake (true if > 0.5)"	Stall Warning (left or right)				LOC-I
Start Abort Detected (left inbd eng)	This event indicates that a possible engine start sequence was aborted on the left inboard engine.	Aborted Start (Best Available) (left inbd eng)		Equal To 1	N2 (left inbd eng) is Greater Than 5 from 2 before to 2 seconds after a point in time. N2 (left inbd eng) is Less Than 50 from -5 before to 10 seconds after a point in time. Engine Running (left inbd eng) is Less Than 1 from 120 before to -118 seconds after a point in time. N2 (left inbd eng) is Less Than or Equal To 45 from -20 before to 30 seconds after a point in time.	SCF-PP
Start Abort Detected (right inbd eng)	This event indicates that a possible engine start sequence was aborted on the right inboard engine.	Aborted Start (Best Available) (right inbd eng)		Equal To 1	N2 (right inbd eng) is Greater Than 10 from 2 before to 2 seconds after a point in time. N2 (right inbd eng) is Less Than 50 from -5 before to 10 seconds after a point in time. Engine Running (right inbd eng) is Less Than 1 from 120 before to -118 seconds after a point in time. N2 (right inbd eng) is Less Than or Equal To 45 from -20 before to 30 seconds after a point in time.	SCF-PP
TCAS Resolution Advisory	This event indicates that a resolution advisory is active. This is an indication by the Traffic Collision Avoidance System (TCAS) that a midair collision situation is imminent, requiring immediate action. Required flight parameters: "TCAS Resolution Advisory (true if > 0.5)"	TCAS Resolution Advisory	True for TCAS Resolution Advisory (Caution Threshold) seconds after a point in time.	True for TCAS Resolution Advisory (Warning Threshold) seconds after a point in time.		MAC
TCAS Traffic Advisory	This event indicates that a traffic advisory is active. This is an indication by the Traffic Collision Avoidance System (TCAS) that a potential (midair) collision situation is developing. Required flight parameters: "TCAS Traffic Advisory (true if > 0.5)"	TCAS Traffic Advisory			Suppress TCAS TA is Equal To 0	MAC
Thrust Reversers not Stowed while Airborne	This event indicates that one or more thrust reversers are not fully stowed during flight. The flight safety concerns are possible loss of structural integrity of the airplane or loss of control.	Thrust Reversers Stowed		Greater Than 0.5 for 2 seconds after a point in time.	Thrust Reversers in Transit is Greater Than 0.5 for 2 seconds after a point in time.	SCF-PP

Unstable Approach	This event indicates that one or more stable approach criteria were violated. There are currently a total of 18 possible criteria (listed below). The user selects the stable approach criteria of interest by only entering values for the flight constants that correspond with them. Stable Approach Criteria: 1) Above Desired Glide Path 2) Below Desired Glide Path 3) Not Aligned with Runway (Localizer Deviation) 4) Fast Approach (Airspeed vs. Vapp) 5) Fast Approach (Airspeed vs. Vref) 6) Fast Approach (Ground Speed) 7) Slow Approach (Airspeed vs. Vapp) 8) Slow Approach (Airspeed vs. Vref) 9) High Rate-of-Descent 10) Low Power 11) Final Flap change is Late 12) Final Flap Setting not Valid for Landing 13) Gear Extension is Late 14) Unsteady in Pitch 15) Unsteady in Roll 16) Unsteady in Yaw 17) Ground Spoilers Armed Late 18) Speed Brakes Used during Approach 19) High Angle of Attack on Approach	Number of Stabilized Approach Criteria that were Not Met	Greater Than or Equal To 1	Greater Than or Equal To 3	ALAR
Upper Maneuvering Load Limit Exceeded (Flaps Down)	This event indicates that the maximum normal load-factor (the apparent acceleration in the body "up" direction), that occurred while airborne with the flaps extended, exceeded the upper structural or maneuvering limit for this fleet. Required flight parameter: "Acceleration (normal load-factor)" Required flight constant: "Normal Load-Factor Maximum (Flaps Down)" Associated measurement: "Maximum Normal Load-Factor while Airborne with the Flaps Down"	Maximum Normal Load-Factor while Airborne with the Flaps Down		Greater Than 2	LIM-A
Upper Maneuvering Load Limit Exceeded (Flaps Up)	This event indicates that the maximum normal load-factor (the apparent acceleration in the body "up" direction), that occurred while airborne with the flaps retracted, exceeded the upper structural or maneuvering limit for this fleet. Required flight parameter: "Acceleration (normal load-factor)" Required flight constant: "Normal Load-Factor Maximum (Flaps Up)" Associated measurement: "Maximum Normal Load-Factor while Airborne with the Flaps Up"	Maximum Normal Load-Factor while Airborne with the Flaps Up		Greater Than 2.5	LIM-A
VFE (Flap Airspeed Limit) Exceedance	This event indicates that the (placard) airspeed limit for the current flap position has been exceeded. The flap speed limit is abbreviated as VFE, which refers to Velocity_Flaps_Extended. Exceedance of this limit may warrant maintenance action. Note that the event compares the calibrated airspeed with the limit for the current flap position, if recorded, else the flap handle position is used. Required flight parameters: "Airspeed (calibrated)", "Flap Position (+=TED)" OR "Flap Handle Position", "Flap Speed Limit" (VFE) Associated Measurement: "VFE: Maximum Exceedance while Airborne"	VFE Exceedance	Between (inclusive) 0 and 150 for 2 seconds after a point in time.	Between (inclusive) 10 and 150 for 2 seconds after a point in time.	LIM-A
VLE (Gear-Down Airspeed Limit) Exceedance	This event indicates that the calibrated airspeed limit, for flight with the landing gear extended, has been exceeded. The limit is abbreviated VLE for Velocity_Landing gear_Extended. Exceedance of this limit may warrant maintenance action. Required flight parameters: "Airspeed (calibrated)", "Landing Gear Down and Locked (true if < 0.5)" OR "Landing Gear Handle (down if > 0.5)" OR "Landing Gear Fully Retracted (true if < 0.5)" Required flight constant: "VLE" Associated Measurement: "VLE: Maximum Exceedance"	Exceedance of VLE	Between (inclusive) 0 and 150 for 2 seconds after a point in time.	Between (inclusive) 10 and 150 for 2 seconds after a point in time.	LIM-A

VMO Exceedance	This event indicates that the maximum operating airspeed for this airplane type has been exceeded. This calibrated airspeed limit is abbreviated VMO for Velocity_Maximum_Operating. A possible flight safety issue associated with this event is buffeting. Required flight parameter: "Airspeed (calibrated)" Required flight constant: "VMO" Associated Measurement: "VMO: Maximum Exceedance while Airborne"	Exceedance of VMO	Between (inclusive) 10 and 150 for 2 seconds after a point in time.	Between (inclusive) 15 and 150 for 2 seconds after a point in time.	LIM-A