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# Flight Data Monitoring



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## **PREFACE**

Many of you have heard about Flight Data Monitoring and we are sure you are wondering just exactly what it is all about.

We are confident after reading the enclosed information that you will have a better understanding of Flight Data Monitoring (FDM), how it will assist you, your crew, and the company.

FDM will represent a change. We know from past experience that change can bring uncertainty and non acceptance, however we have to keep in mind that the ultimate goal of FDM, is to enhance safety in our day to day operation.

With this vision from the highest level of our Management, the acceptance and the inputs of everybody participating in the Flight Data Monitoring process, everyone from you to the company, to the International Aviation Community will learn and perform a safer line operation.

Before we present you an overview of the FDM program and how it integrates to the synergy of the Safety Management System you will have the opportunity to examine [Airline] safety policy, safety commitment and the non-reprisal policy that are an integral part of our OM A chapter 2. Furthermore, I would like to highlight that this document is based on the JAR's and ICAO requirements and recommendations.

[Airline] is committed to the highest level of safety. Adopting this safety approach will enable us to have a lengthy success.

Safety first and always.  
Best regards,

Captain Your Name  
Head of Flight Safety

## **ACCIDENT PREVENTION AND FLIGHT SAFETY PROGRAM**

### **[AIRLINE] SAFETY POLICY**

There will always be hazards, both real and potential, associated with the operation of any aircraft. Technical, operational and human failures induce the hazards. The objective of the Company's Accident Prevention and Flight Safety Program is to address and control them.

This is achieved by the careful recording and monitoring of operational, engineering, and human safety-related occurrences for adverse trends in order to prevent the recurrence of similar incidents which could lead to an aircraft accident.

### **[AIRLINE] SAFETY COMMITMENT**

[Airline] has defined Flight Safety as the most valuable asset and therefore follows a company wide best practice policy rather than a minimum regulatory compliance.

#### **Flight Safety**

**shall not be jeopardised under any circumstances and  
no compromises shall be tolerated.**

## **[AIRLINE] NON-REPRISAL POLICY**

[Airline] is committed to the safest flight operating standards possible. It is therefore imperative that we have uninhibited reporting of all incidents and occurrences, which compromise the safe conduct of our flights. To this end, every employee is responsible for communicating any information that may affect the integrity of Flight Safety. Such communication is completely free of reprisal.

[Airline] will not take disciplinary action against any employee who discloses an incident or occurrence involving Flight Safety. This policy shall not apply to information received by the Company from a source other than the employee. However, wilful violation is not tolerated and will be sanctioned.

The primary responsibility for Flight Safety rests with Post Holders. Remember that Flight Safety is everyone's concern.

Our method of collecting, recording and disseminating information obtained from Operations Reports, Air Safety Reports, Technical Reports, Confidential Reports and Flight Data Monitoring has been developed to protect to an extent permissible by law the identity of any employee who provides Flight Safety information.

I urge you all to use our accident prevention and Flight Safety program to help [Airline] become the leader in providing customers and employees with the highest level of Flight Safety.

signature

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**CEO Accountable Manager**

## **GENERAL**

Flight Data Monitoring information (identified or de-identified) shall not be released to any third party without prior approval of the Accountable Manager, who is ultimately responsible of the safe conduct of our operation. Exception made to the request by the appropriate governmental agencies which may be given access to de-identified data on the Company property when required by law.

Any [Airline] employee/agent who has contact with any identified data used in a FDM program shall be prohibited from revealing any identifying data to any individual other than the FDM team members.

In the event any [Airline] employee/agent reveals any identified data to other individuals other than the designated FDM Team member, such employee/agent shall immediately be removed from participation in the FDM Program.

## **FDM TEAM CONFIDENTIALITY**

Any information, memoranda, or other documents used by the FDM team members in contact with a flight crew member concerning an occurrence shall be considered "IDENTIFIED DATA" for this process and shall be "de-identified" before any further distribution.

Every Flight Data Monitoring team member has to sign a non-disclosure agreement which bounds the person to confidentiality as stated under ANNEXE B.

## MILESTONES OF FDM PROGRAM

### Short term

- Configure all Aircraft with required hardware and software.
- Establish data collection and download process.
- Test and fine tuning of the entire system.
- Identify aircraft data defects.
- Validate and investigate exceedance data.
- Establish statistics.

### Medium term

- Produce biannual report - include key performance indicators.
- Add other modules to analysis (e.g. Continued Airworthiness).
- Plan for next fleet to be added to the program.

### Long Term

- Use information across company information systems for enhancement of operation (e.g. engine trend monitoring, fuel efficiency, performance calculation, vibration monitoring).
- Ensure FDM provision for any proposed "Advanced Qualification Program" style training.
- Use monitoring to reduce spares parts holdings.

## WHY IS THE FDM PROGRAM AT [AIRLINE] ?

As you have read in the [Airline] safety commitment we will not tolerate any compromises about safety. Despite the fact that the initial cost of such program is considerable, the management is convinced that the return on capital and human investment will be more profitable and pro-active than any lessons that we could learn only after a major occurrence.

Additionally, we have the legal requirement, as per

### **EU-OPS 1.037 Accident Prevention and Flight Safety Program**

a) An operator shall establish and maintain an accident prevention and Flight Safety Program, which may be integrated with the Quality System, including:

- 1) Programs to achieve and maintain risk awareness by all persons involved in operations; and
- 2) An occurrence reporting scheme to enable the collation and assessment of relevant incident and accident reports, in order to identify adverse trends or to address deficiencies in the interests of Flight Safety. The scheme shall protect the identity of the reporter and include the possibility that reports may be submitted anonymously; and
- 3) Evaluation of relevant information relating to incidents and accidents and the dissemination of related information, but not the attribution of blame; and
- 4) From 1<sup>st</sup> January 2005, a FDM program for the aircrafts in excess of 27,000kg MTOW. FDM is the pro-active use of digital flight data from routine operations to improve aviation safety. The FDM program shall be **non-punitive** and contain adequate safeguards to protect the source(s) of the data; and
- 5) The appointment of a person accountable for managing the program.

b) Proposals for corrective action resulting from the accident prevention and flight safety program shall be the responsibility of the person accountable for managing the program.

c) The effectiveness of changes resulting from proposals for corrective action identified by the accident and flight safety program shall be monitored by the Manager of Quality.

d) The flight data analysis program shall be non-punitive and contain safeguard to protect the source of the data.

## WHAT IS THE ROLE OF FDM ?

The FDM program role is to bring factual data from the day to day operation into an overall safety approach of the company's operation.

This integrated systemic approach is called Safety Management System (SMS). One of the important characteristics of SMS is the pro-activity.

As all of us are concerned about Flight Safety, we are all the eyes and ears of the system allowing us to identify the potential risk and then produce a fix or prevention for the undesirable occurrence in our operation.



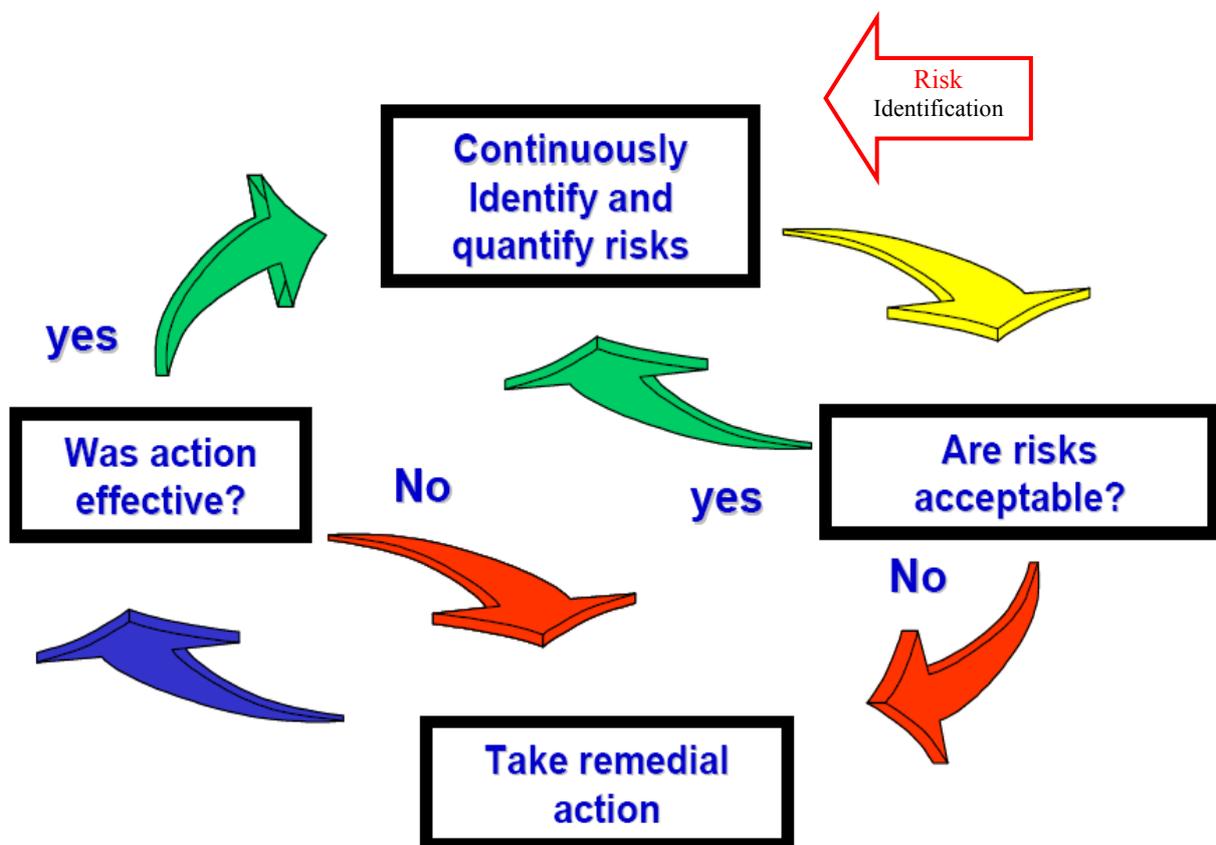
### Keep in mind

"If we don't know it we can't fix it"

SMS is to be seen and used as an essential tool to all implicated parties in our daily operation, as we have committed to not just meet, but to exceed the minimum acceptable level of Safety.

The FDM program mission is to identify areas of potential risk in our operation by providing more information about, and greater insight into the total flight operations environment through analysis of the flight data generated during day to day line operations.

In this case the SMS will use the factual inputs from the flight data collection process to provide a continuous diagnostic of the organisational strengths and weaknesses, as well as an overall assessment of standards in a day to day flight operation environment. The outcome of this process is to provide [Airline] with data-driven solutions to enhance overall company operation safety, and to mitigate the risks to an acceptable level to all parties involved in the process.



## THE SCOPE OF THE FDM PROGRAM

FDM system allows an operator to compare the actual achieved standard in everyday line flights along with standard target and also with the industry standards. A feedback loop (SMS) will allow a timely corrective action to be taken where safety may be compromised by significant deviation from standards.

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

Assessment to identify deviations from standards or areas of risk and measure current safety margins. This will establish a baseline operational measure against which to detect and measure any change.

**Example:** rates of rejected take-offs, hard landings, unstable approaches.

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

In addition to highlighting changes from the baseline, the system enables the user to determine when non-standard, unusual or basically unsafe circumstances occur in operations.

**Example:** Increases in above rates, new events, and new locations.

### **3. Use the FDM to determine the frequency of occurrence, combined with an estimation of the level of severity, to assess the risks.**

Information on the frequency of occurrence, along with estimations of the level of risk present, is then used to determine if the individual or fleet risk level is acceptable. Primarily the system should be used to work out whether there is a trend towards unacceptable risk prior to it reaching risk levels that would indicate the SMS process has failed.

**Example:** A new approach has introduced high rates of descent that are approaching the threshold for triggering GPWS warnings. The SMS process should have predicted this.

#### **4. To put in place appropriate risk mitigation plan to an unacceptable risk, either actually present or potential.**

Once an unacceptable risk, either actually present or predicted by trending, has been identified, then appropriate risk mitigation techniques must be used to put in place remedial actions. This should be accomplished while bearing in mind that the risk must not simply be transferred elsewhere in the system.

**Example:** Having found high rates of un-stabilised approach at a specific airport, procedures are changed to improve control of the optimum/maximum rates of descent being used.

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

Once a remedial action has been put in place, it is critical that its effectiveness is monitored; confirming that it has both reduced the original identified risk and not transferred the hazard elsewhere.

**Example:** Confirm that the other measures at the airfield with high rates of descent do not change for the worse after changes in approach procedures.

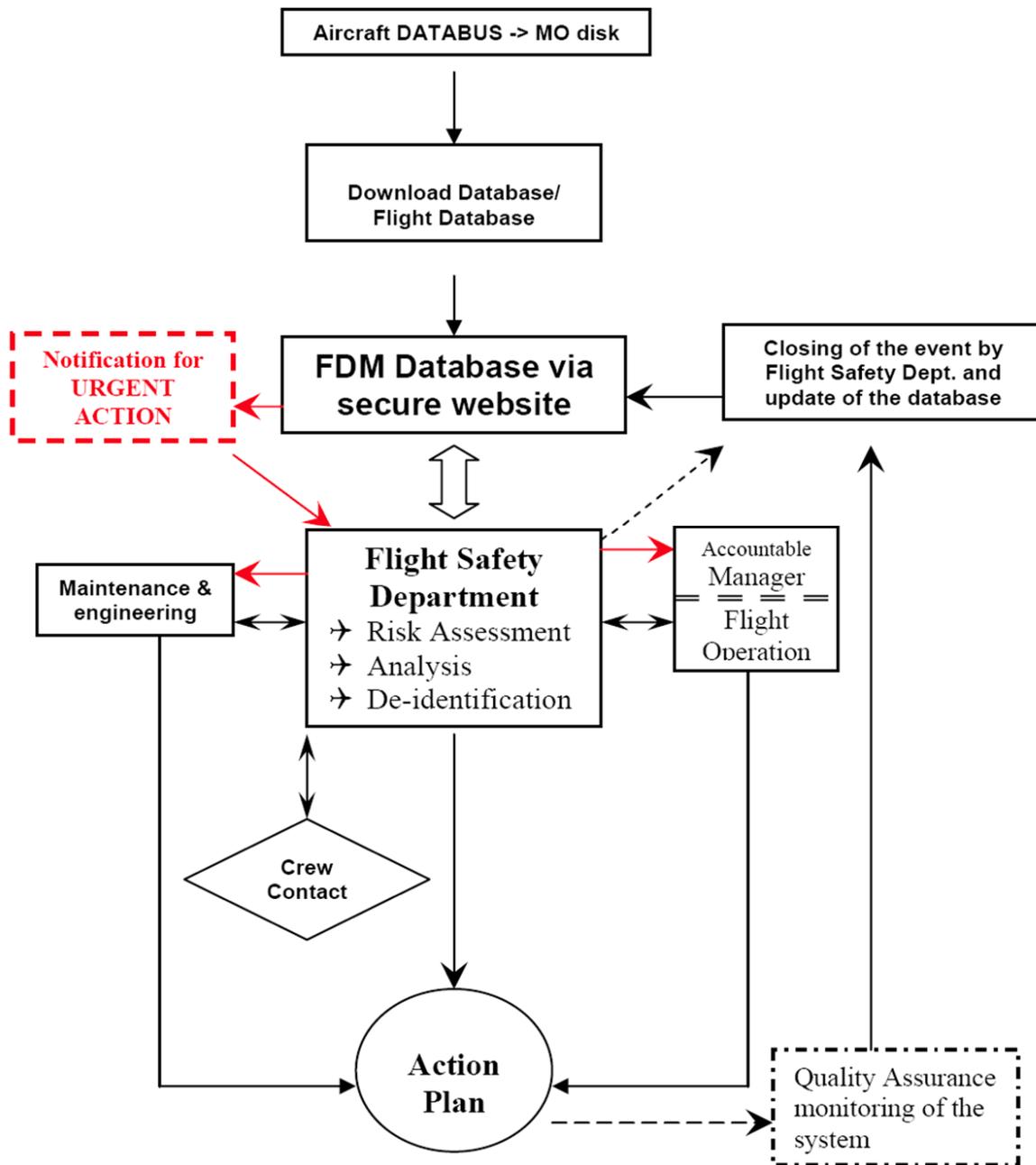
→ The FDM program may be used for, but not limited to, evaluating the following areas:

Aircraft performance  
Crew Performance  
Training program  
Aircraft design  
Airport operation issue

Aircraft systems performance  
Company procedures  
Training effectiveness  
ATC system operation  
Meteorological issue

## HOW DOES IT WORK?

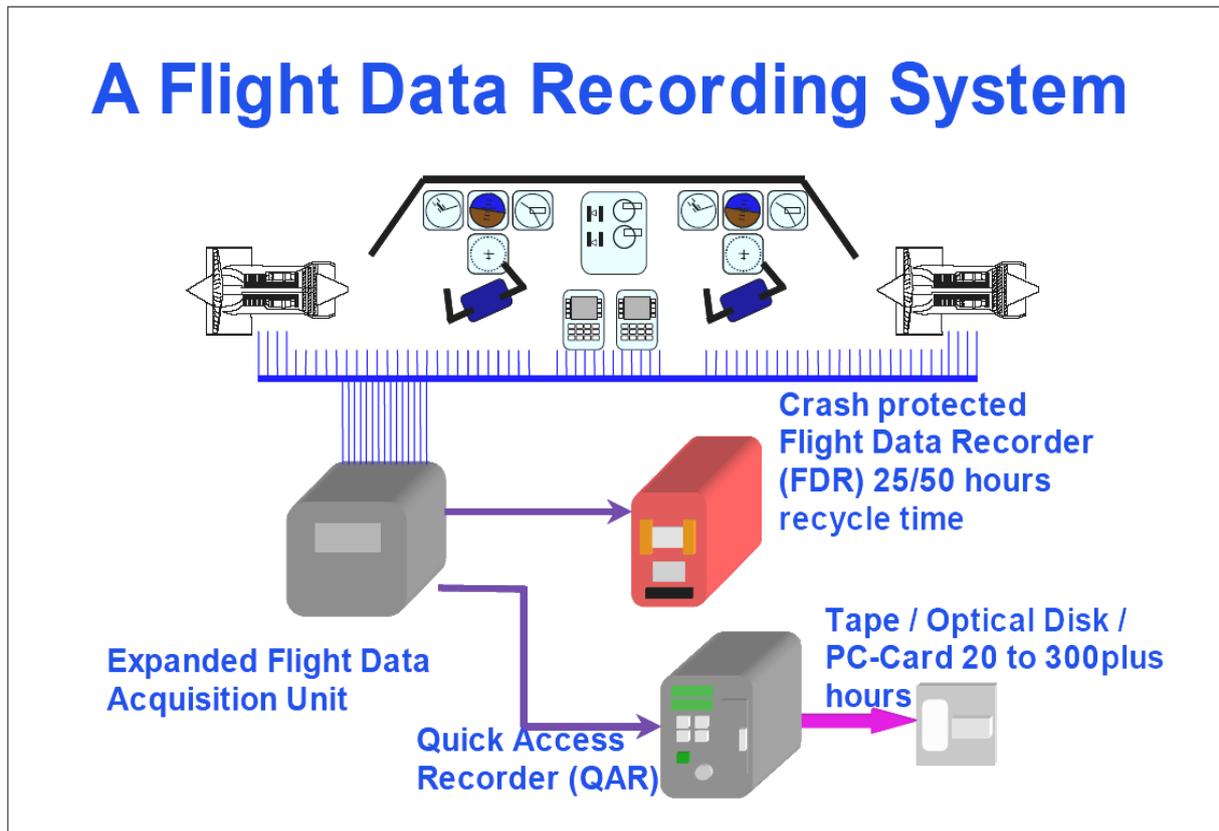
### FDM PROGRAM FLOW CHART



Let us ensure that this is not a program to “look over your shoulder”. The main goal is to enhance the safe operation of [Airline] aircraft, validate pilot training programs, address ATC issues and to extend the operational life of the fleets.

## THE DATA COLLECTION

The data (approx 2500 parameters) is collected from the flight data bus through FDAU and recorded integrally on an **Optical disk (OQAR)**.

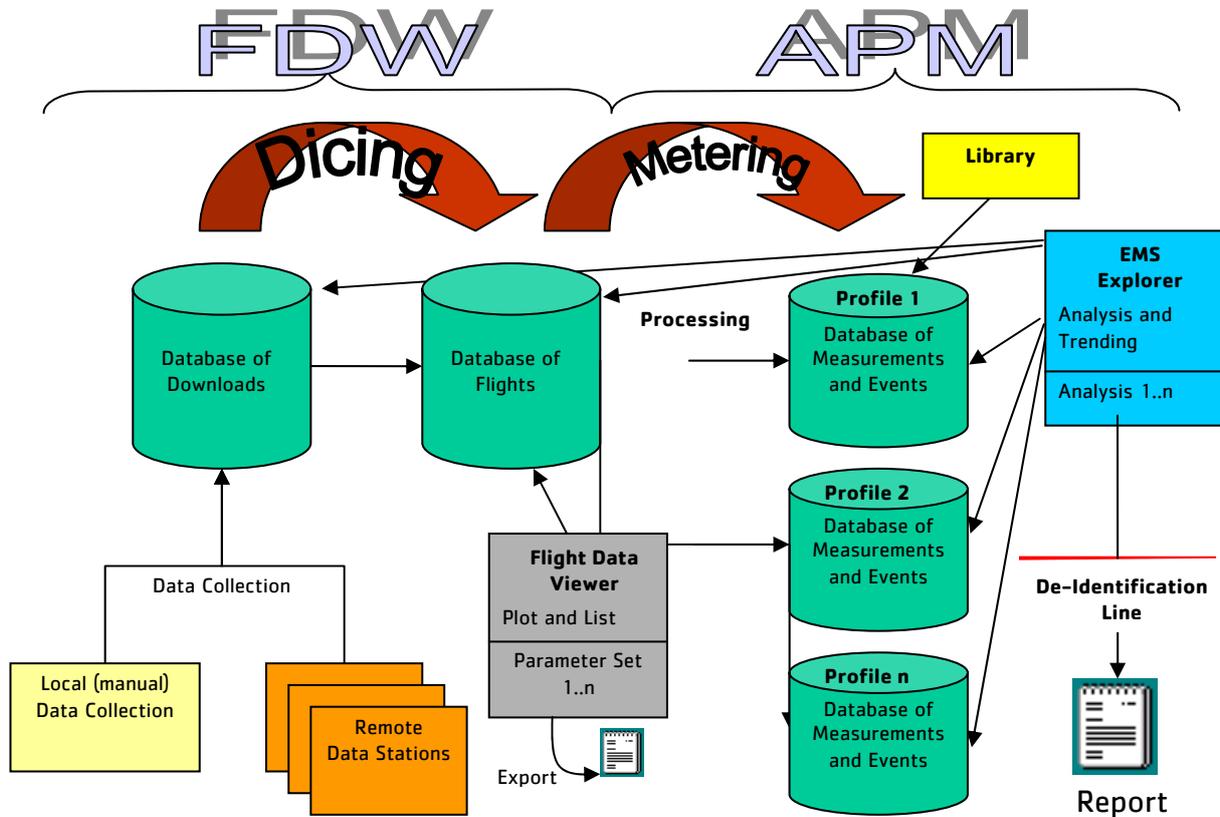


**The Optical Disk (OQAR)** is developed from a standard PC technology with environmental protection. It has a capacity of up to 200 hours of recording at 512 words per sec, which assures no data drop between downloads. Data files are accessible by standard PC hardware but still require engineering decode and display software. With this kind of hardware, the replay rates are much higher than for tape recorder, so the data reliability is highly increased.

All the downloaded flight raw data will be kept in the "DOWNLOAD" database for a period of about 30 days. The flight data (diced)<sup>1</sup> will be kept in the "FLIGHT" database for the archives and statistics as long as [Airline] intends to undergo FDM program. All **de-identified** data, and analyses of such data, shall be available upon request to the other company departments.

<sup>1</sup> during the dicing process the part recorded on ground between the flight, including APU operation is lost

# EMS Overview



Subsequent to the data collection, Flight Safety Department proceed to the analysis of the occurrence to find the root cause and the contributing factors of those events, and propose to the respective department corrective action for enhancements to line operation safety.

There shall be continual evaluation of the parameters exceedance by the Flight Safety Department. Any deletions or additions of parameters are to be **monitored**, and will need to be approved by the Manager Flight Safety. Any special studies or evaluations shall also require approval by the Manager Flight Safety.

Once the respective department has decided and put in place an action plan, the role of the system is to monitor the amended procedure and re-access the trends to validate the corrective actions, and to improve the training program effectiveness, standard operation procedures, human factor awareness and development of CRM technique to make sure that we are producing the right change, for the previously identified risk.

On a second step we will be able to open different projects that have different objectives such as performance, economical maintenance and engineering for:

- engine vibration monitoring
- oil consumption
- HARD landing with inspection requirements
- ATC procedures and airport surface issues

## COMMUNICATION & KNOWLEDGE TRANSFER

The FDM team has four levels of approach for an occurrence:

### Statistical

Data is out of the normal envelope of operation, but has a **low combination of potential risk & recorded recurrence** in our operation. These incidents analysis will be compiled in the follow up database, and the lessons learned must be applied in the decision making process for our training, SOP, line indoctrination and in all the decision making process conducted by the stake holder of our company that affect the safe conduct of our operation.

### Verbal communication

Data is out of the normal envelope of operation. It has a **low/medium combination of potential risk & recorded recurrence** in our operation. The event requires better understanding to extract the lessons learned, draft conclusion and compile the exact information in the database. The crew may be contacted by phone solely by the Flight Safety Department to retrieve the missing details to clarify the root cause of this deviation. This will be compiled in the database. Furthermore the findings of this analysis will be integrated in the decision making process for our training, SOP, line indoctrination and all the decision making process conducted by the stake holder of our company that affect the safe conduct of our operation.

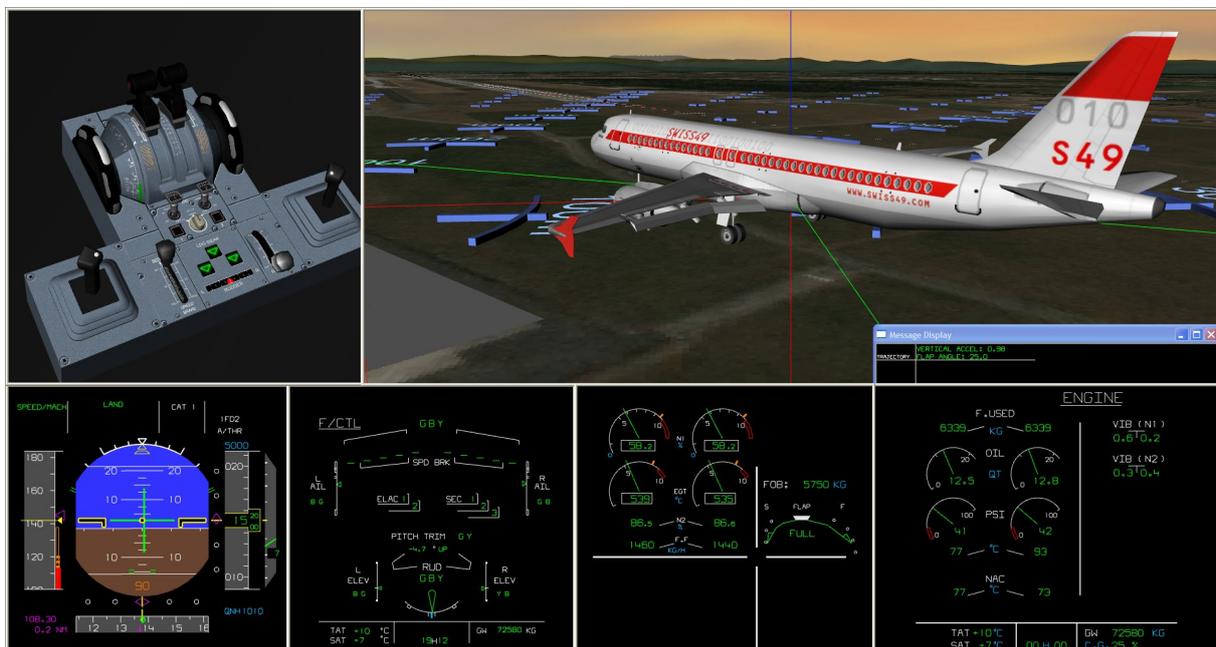
## Summary print out

Data is out of the normal envelope of operation. It has a **combination of medium potential risk and recorded recurrence** and could develop in an undesirable event for our operation. The event requires thorough analysis. The crew will receive a summary print out of the deviation and will be asked to give feedback, to clarify the underlying factors and the root cause of their deviation(s). The extracted lessons learned and the drafted conclusion will be compiled in the database. Furthermore the results of this analysis will be integrated in the decision making process for our training, the SOP, line indoctrination and all the decision making processes conducted by the stake holder of our company that affect the safe conduct of our operation.

FLIGHT INFORMATION																																																							
Operator: Fleet: Falcon 2000	Tail No.: N103AD Flight No.: -----	Flight Record #: 5179 Duration of Flight: 1 hr 54 min																																																					
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## Visualisation

Data is out of the normal envelope of operation. It has a combination of **medium/high potential risk and recorded recurrence** and could develop in an undesirable/dramatic event for our operation. The event requires better understanding for the flight safety enhancement of our company. The crew will receive a summary of the deviation in a print out format and also they will be invited to the flight safety department to see a visual reconstitution of their flight<sup>2</sup> and this for the sole purpose of understanding what lead them to this situation. The crew will be invited to give feedback, to clarify the underlying factors and the root cause of their deviation(s). The extracted lessons learned and the drafted conclusion will be compiled in the database and furthermore the results of this analysis and the lessons learned will be integrated in the decision making process for our training, the SOP, line indoctrination and all the decision making processes conducted by the stake holder of our company that affect the safe conduct of our operation.



<sup>2</sup> Visualization will be designed in a manner that the crew cannot be identified

## Crew request Flight Data Evaluation

Data is within or out of the normal envelope of FDM. Nevertheless, the crew believe there is **something to learn** about a specific situation. In this case the crew will fill in a Flight Data Evaluation Order and send it to the Flight Safety Department to have access to their own flight data only. Refer Annexe C for Flight Data Evaluation Order.

## URGENT ACTION

There are few circumstances where FDM data will indicate that immediate safety action is required and a fast procedure to ensure safe critical remedial action should be defined. In general, the urgent actions are associated with Continued Airworthiness checks, rather than operational situations.

*For example, a very heavy landing with potential damage that has not been reported by other means should trigger relevant structural checks as soon as possible, whereas crew remedial investigations are not so urgent.*

## ALLOCATION OF FOLLOW-UP COORDINATOR

Once a basic assessment has been carried out and has revealed a significant risk, or aspect requiring further investigation, one particular person in the flight safety department will be allocated follow-up responsibility. This responsibility is normally clearly defined by the type of incident. However, on occasions there may be a need to involve several departments or even organizations and in this case the follow-up coordinator will act as a focal point for the investigation.

## FREQUENTLY ASKED QUESTIONS

In this section we have attempted to address the most frequently asked questions to give each pilot a better idea of the program.

- Q1** Why would you ever need to contact a pilot if the system reads over 2500 parameters? Don't you already know everything you need to know about my flight?
- A1** The recorded parameters only show what the aircraft was doing at any given time. Those data will not tell the reason behind and why the aircraft was flying the way it was. Only the crew knows the answer to those questions and the full context. In most cases the crew is just using their good judgment to react to an external situation.
- Q2** During my flight, I experienced a situation that is listed in the reportable occurrences to the CAA, do I still have to fill an ASR?
- A2** Yes, as we have the responsibility to report those occurrences the FSD will need the most accurate information to transmit the report to CAA since, it is always easier to be pro-active in that situation, and you should fill out an ASR form.
- Q3** Where is the Flight Data stored, who can access it and how is it protected?
- A3** The flight data is stored on a dedicated data base server. The identification part of this data can only be accessed by FDM team members from the Flight Safety Department. The server is protected with 128 bit encryption technology through multiple firewalls. It is the same encryption technology you are using for your internet banking.

**Q4** What happens to the optical disk after the data is extracted?

**A4** The optical disk is formatted and returned to service. Furthermore, the FDM data on the optical disk is securely protected due to the fact the data is unreadable without the software associated with the program, which, can be accessed only by a designated person to a certain level.

**Q5** Can Flight Data Monitoring be used against me for prosecution?

**A5** No, as the Flight Data Monitoring scope is to enhance safety, Flight Data will never be used to take any disciplinary action against any crew member. Nevertheless, the Digital Flight Data Recorder (DFDR) can still be retrieved by any authority anywhere in the world if they have reason to do so.

## DEFINITIONS

### **Accident** (ICAO Annex 13)

An occurrence associated with the operation of an aircraft which takes place between the time any person boards the aircraft with the intention of flight until such time as all such persons have disembarked, in which:

- a) a person is fatally or seriously injured,
- b) the aircraft sustains damage or structural failure,
- c) the aircraft is missing or is completely inaccessible.

### **Dicing process**

Process executed by qualified personnel on the raw data downloaded from the aircraft, to separate the flight in a specific record and to delete noise data between the flights.

### **FDAU**

Flight Data Acquisition Unit, a module that concentrates on the flight data collected from the flight data bus.

### **FDM team**

The FDM team will be composed exclusively with [Airline]. The Flight Safety Department personnel do not have a disciplinary authority over the flight crew. All members of this team have to be properly qualified for the related work. The FDM monitoring team also have the role of the *GATEKEEPER*.

### **FDM Program**

A non-punitive flight data collection process providing a continuous diagnostic of the organisational strengths and weaknesses, as well as an overall assessment of standards in a normal flight operation environment. The outcome of this process is to provide the airline with developing data-driven solution to enhance overall company operation of Flight Safety.

### **Gatekeeper**

The person from the FDM monitoring team alone will have the access to, and be able to retrieve identifying information from the **database**.

### **Hazard**

A physical situation often followed from some initiating event, which can lead to an accident.

### **Incident**

An occurrence, other than an accident, associated with the operation of an aircraft which affects or could affect the safety of operation.

### **Identified Data**

Is any data or combination of data which allows collected data to be associated with a specific flight crew or a specific flight on a specific day.

### **Information**

Shall include any data transmitted, recorded or collected, by use of flight data recorder, Cockpit voice recorder or any other recording device. The term "information" shall further include tapes, transcripts, reports, papers, memo, statement, studies, charts, graphs, or any other description analysis, or compilation of data by any such equipment.

### **Level of Safety**

A level of how far safety is to be pursued in a given context, assessed with reference to an acceptable risk, based on the current values of society.

### **LOSA**

Line Operation Safety Audit – pro-active safety data collection program based on a non-punitive approach. The data provides a diagnostic snapshot of organisational strengths and weaknesses, as well as an overall assessment of standard operation in a normal environment. The outcome of this process is to provide the airlines with a data-driven solution to improve overall safety.

### **Operational Data**

Any data acquired, transmitted or downloaded from a flight data recorder, or gathered information to the related flight.

### **Operational Exceedance Event**

An event, as determined by recorded operational data, indicating that an aircraft was in a situation outside of the normal operational envelope tolerance.

### **Operational Routine Event**

An event, in routine operation of statistical interest such as, flaps are in retraction sequence in departure profile.

### **Optical disk (OQAR)**

Peripheral developed from standard PC technology, with environmental protection. It has a capacity normally exceeding time period required between downloads. Data files are accessible by standard PC hardware, but still require engineering decode and display software. Replay rates are much higher than tape recorders.

### **OHS**

Occupational Health and Safety, this program covers all safety related items that are not part of the airworthiness of an aircraft. This protocol is taking care of the work environment.

### **Qualitative**

The analytical process that applies subjective, non-numerical methods to assess the system and aircraft safety.

### **Quantitative**

The analytical process that applies mathematical methods to assess the system and aircraft safety.

**Risk**

Event, condition, circumstances which may lead to an unacceptable loss or produce an undesired situation.

**Risk Assessment**

Assessment of the system or component to establish the achieved risk level is lower than or equal to the tolerable risk level.

**Safety Assessment**

A systematic, comprehensive evaluation of an implemented system to show that the safety requirements are met.

**Safety Objective**

A safety objective is a planned and considered goal that has been set by a design or project authority.

**Safety Policy**

Defines the fundamental approach to managing safety and that is to be adopted within an organization and its commitment to achieving safety.

**Severity**

The potential consequences of a hazard.

**SMS (Safety Management System)**

Explicit element of the corporation, which as a systemic pro-active approach to manage the risks associated with all related group producing the operation and this; to achieve the process of the daily business with the highest performance of the overall levels of safety feasible.

**System**

A combination of physical components, procedures and human resources organized to achieve a function.

**Urgent Actions**

Circumstances where FDM data will indicate that immediate safety action is required and a fast procedure to ensure safety critical remedial action should be defined. In general, the urgent actions are associated with continued Airworthiness checks, rather than operational situations.

## **ANNEXE A**

### **REPORTABLE OCCURRENCES JAR-OPS PART VI SECT. 4.3**

The **CAA** shall be notified when an aircraft accident or any of the incidents as listed below occur:

- Flight control system malfunction or failure
- Inability of any required flight crew member to perform his normal flight duties as a result of injury or illness
- Failure of structural components of a turbine engine excluding compressor and turbine blades and vanes
- In-flight fire, Aircraft collide in flight.
- In-flight failure of electrical systems which requires the sustained use of an emergency bus powered by a back-up source such as a battery, auxiliary power unit, or air-driven generator to retain flight control or essential instruments
- In flight failure of hydraulic systems that result in sustained reliance on the sole remaining hydraulic or mechanical system for movement of flight control surfaces
- sustained loss of the power or thrust produced by two or more engines
- Evacuation of an aircraft in which an emergency outlet system is utilised

Significant incidents involving:

- 1) The transport of dangerous goods
- 2) Breaches of Security
- 3) The carriage of important persons
- 4) A serious maintenance event and/or failure
- 5) Aircraft departure of taxiways/runways
- 6) Taxi accidents/collisions
- 7) Flight crew incapacitation
- 8) Decompression resulting in emergency descent
- 9) ATC incidents involving near collisions, serious wind-shear, passenger offences affecting safety and passenger offences affecting safety and any other factors affecting or derogating safety
- 10) An aircraft is overdue and is believed to have been involved in an incident

## ANNEXE B

# Confidentiality Agreement

I, \_\_\_\_\_, hereby acknowledge that:

1. Any information obtained during the FDM process, from any relationship with [Airline], or the context in which the information was imparted to me constitutes confidential, privileged, proprietary or restricted information.
2. I will not disclose, reveal, transmit or use any information outside the Flight Safety Department or [Airline], other than for the purpose of carrying out my duties to [Airline].
3. I will not disclose, reveal, use or transmit any identifying information to any other department of the company in any circumstances.
4. Flight safety information is sensitive materiel for company's and individual's reputation and that I must always take actions solely to pursue the ultimate goal of Flight Safety enhancement.
5. If my duty, so requires me to transmit information outside [Airline] to fulfil legal requirements, I must first obtain the express and specific written permission of the Accountable Manager.

Having read and understood the above mentioned articles.

Signed in [City], on the \_\_\_\_ of \_\_\_\_\_ 20\_\_

Signature: \_\_\_\_\_

