

DATA IN THE AIR: FLIGHT OPERATIONS



Foto: Javier Guerrero

1**Quick Introduction****2****Flight Data Monitoring into Safety Management Systems****3****Limitations****4****New initiatives**



ICAO



EASA



FAA



CAAC

FDA

=

FDM

=

FOQA

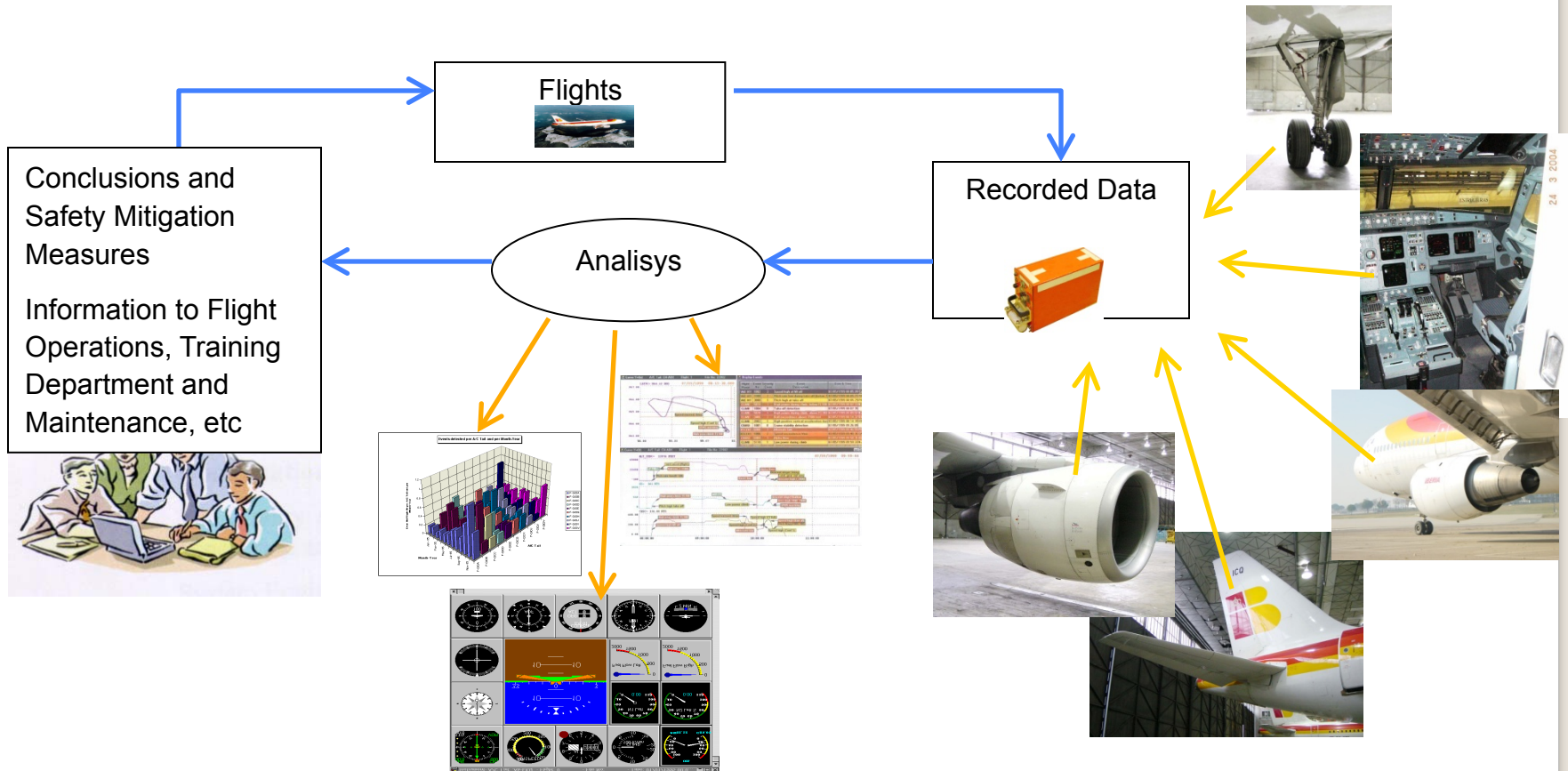
Introduction

- **FDM is in use on the Airline Industry since 30 years ago.**
- **Mandatory since 2005.**
- **Our best Safety Tool, not very well known.**
- **Confidential use. Result of the Just Culture.**
- **Under used, large development capacity.**

INTRODUCTION



FDM Process



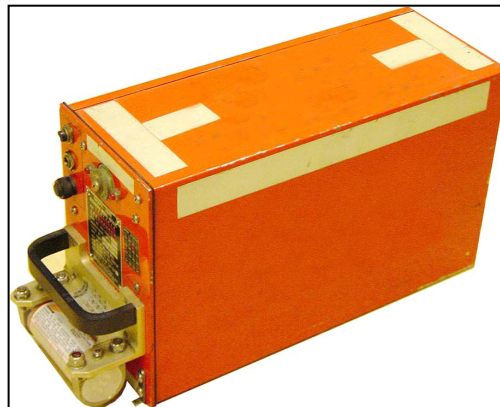
FDM, the best Safety Tool on XXI Century

Two types of Data Recorders:

- FDR (Flight Data Recorder o Crash Recorder). The use of FDR, or Crash Recorders is mandatory.

OACI establece en su Anexo 6, capítulo 6, apartado 6.3.2 que *“todos los FDR deberán poder conservar la información registrada durante por lo menos las últimas 25 horas de su funcionamiento”* refiriéndose a los equipos de tipo I.

En el punto 6.3.3.1 especifica que *“todos los aviones que tengan una masa máxima certificada de despegue superior a 27.000 Kg. estarán equipados con FDR de tipo I”*.



INTRODUCTION



- QAR/DAR (Quick Access Recorder/Digital Adquisition Recorder). Downloads the data to cards PCMCIA, tapes, optic disks or wireless.

Los Organismos Internacionales recomiendan a las compañías el uso de los registradores de acceso rápido (QAR) como primer paso para la explotación de sus datos de vuelo, dado su mayor número de parámetros grabados, su mayor capacidad de almacenamiento, su menor y más adecuado tamaño, y su fácil acceso y extracción.



**Designed for FDA
NOT designeg for accident or incident investigations!**

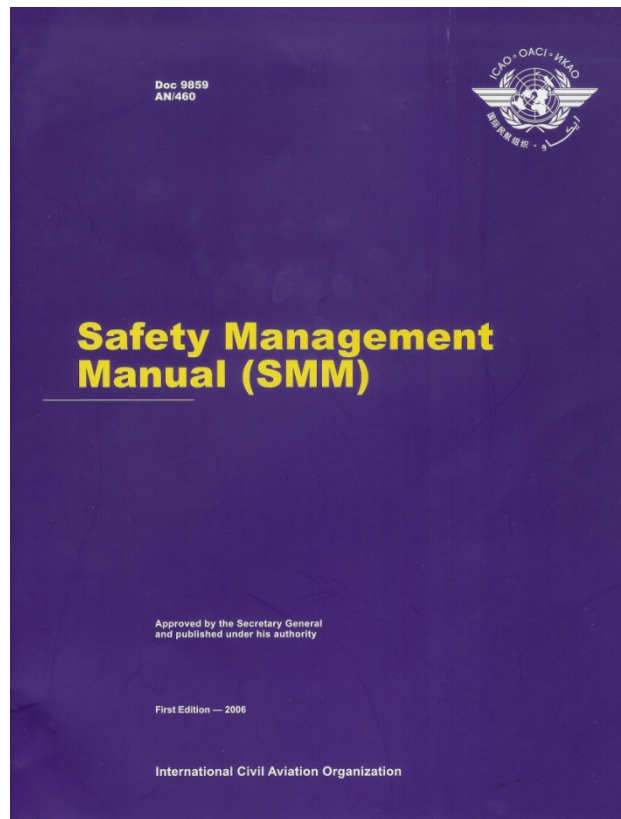
INTRODUCTION

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3 D Representation



Use of the FDA in Safety Management System

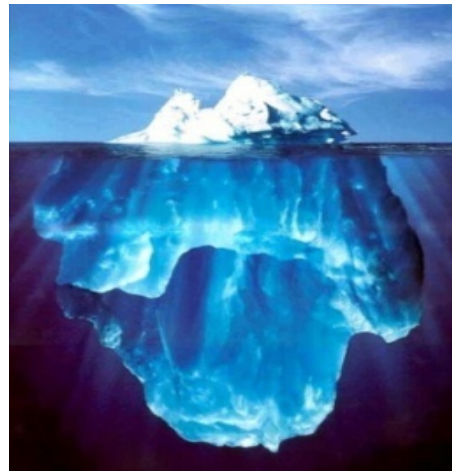


Use of the FDA in Safety Management System



Event Analysis

Reactive Process



Precursors

Complement of the pilot report

Preventive Process



Trend Analysis

- Index
- Reliability

Risk Analysis

Predictive Process

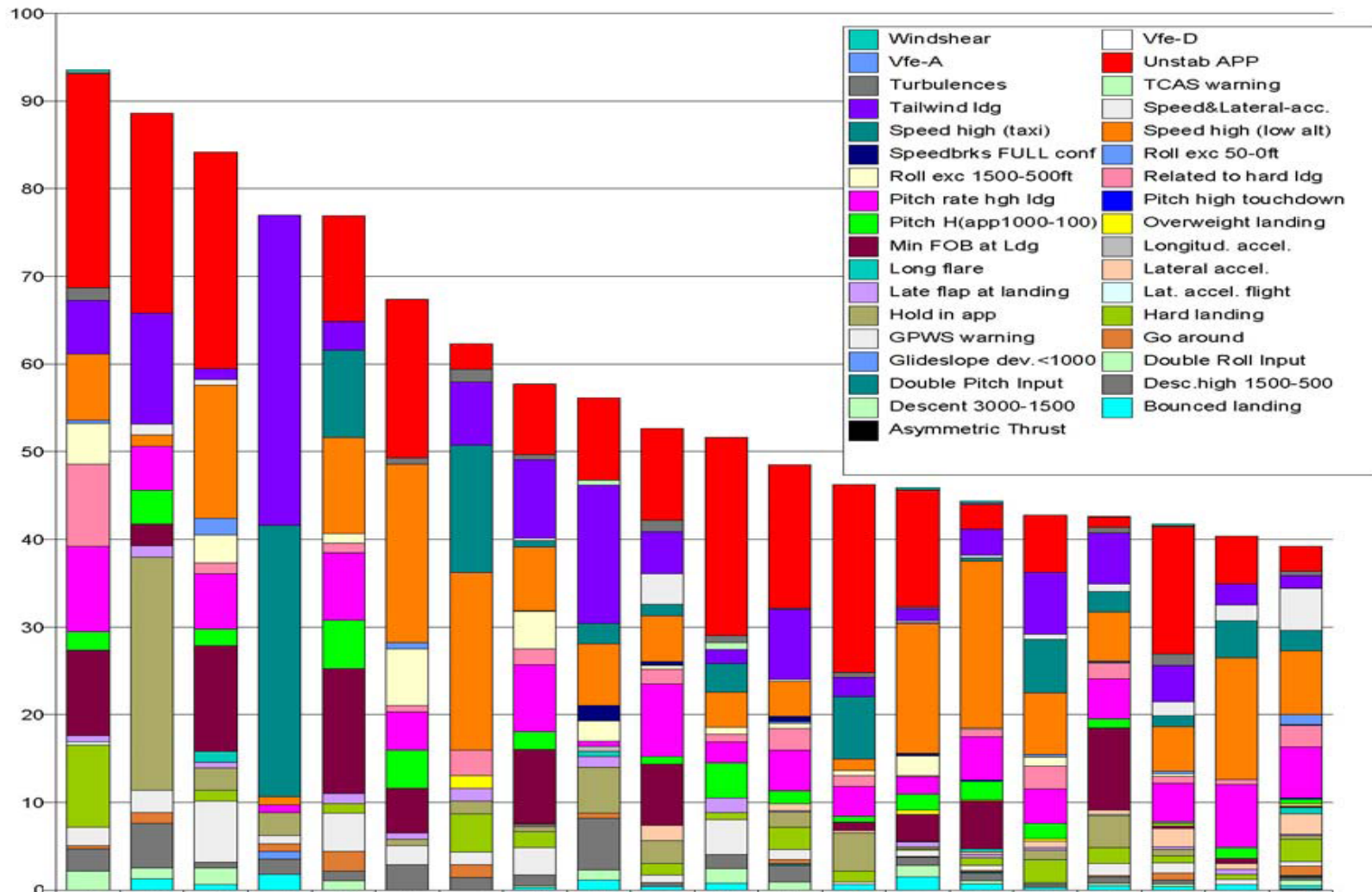
Integration on the SMS



Operations

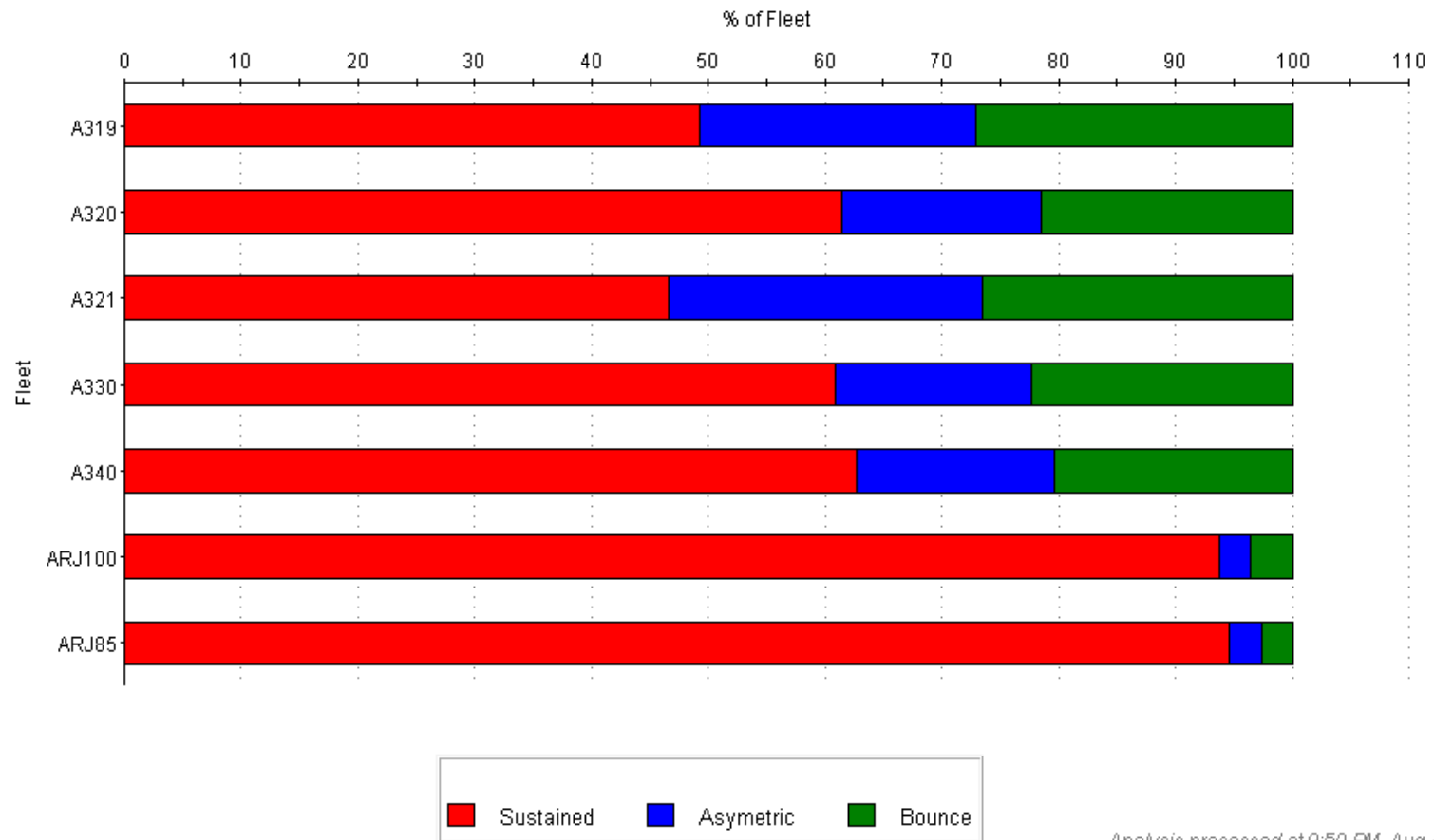


Internal use of FDA in a SMS

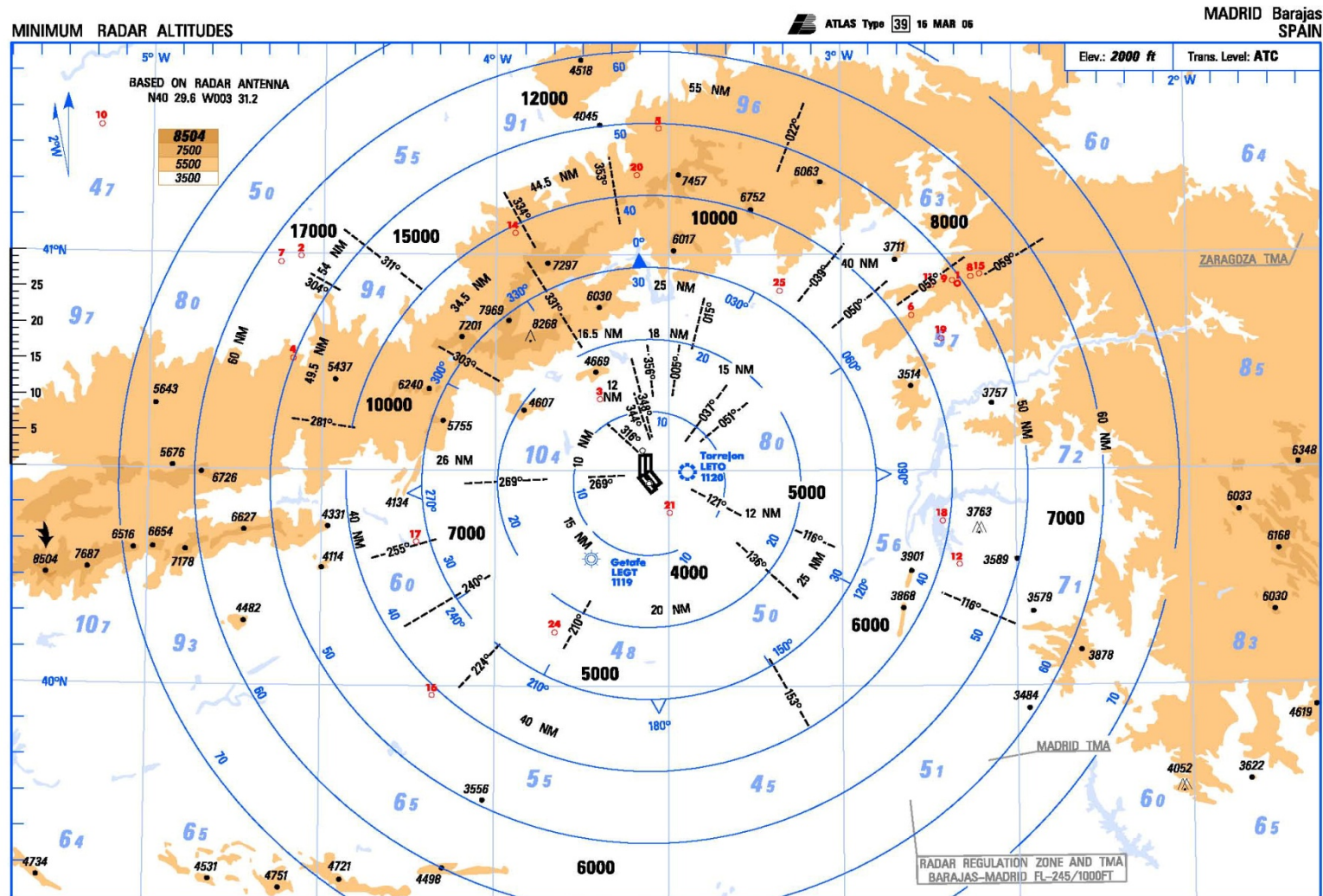


Ranking of European Airports with FDM events (*names erased purposely*)

Touchdown Categories



External use of FDA in a SMS



Changes:

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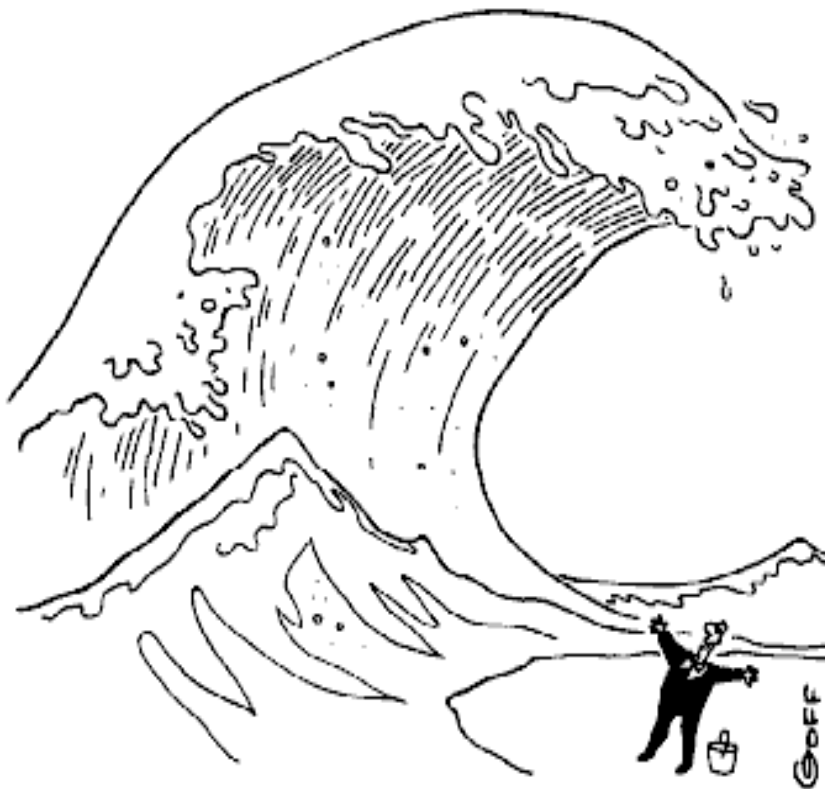
MAD/LEMD

Limitations



Data Volume

© 1996 Ted Goff



"EUREKA! MORE INFORMATION!"

- Selection of Parámetros
- Treatment
- Limited resources
- Analysis Capacity
- Appropriate approach
- Storage Capacity

Specialists

- Proper Analysis
 - Symptoms
 - Calibration of information
 - Interpretation of the data
 - Search of precursor
- Programing Algorithms.
- Validation of the Analysis
- Lack of specialists.
- No formal training for specialists.



Reliability

- Amount of flights recorded
 - QAR monitoring
 - % of Fleet Equiped
 - Increased number of inputs
- Quality of the Data
 - Calibration
 - Filtering
 - Validation



Regulation

- Subject of agreements.
- Need continuous updating.
- Wide view of the FDA analysis.
- Mutual trust.
- Subject to fluctuations unrelated to the operation.

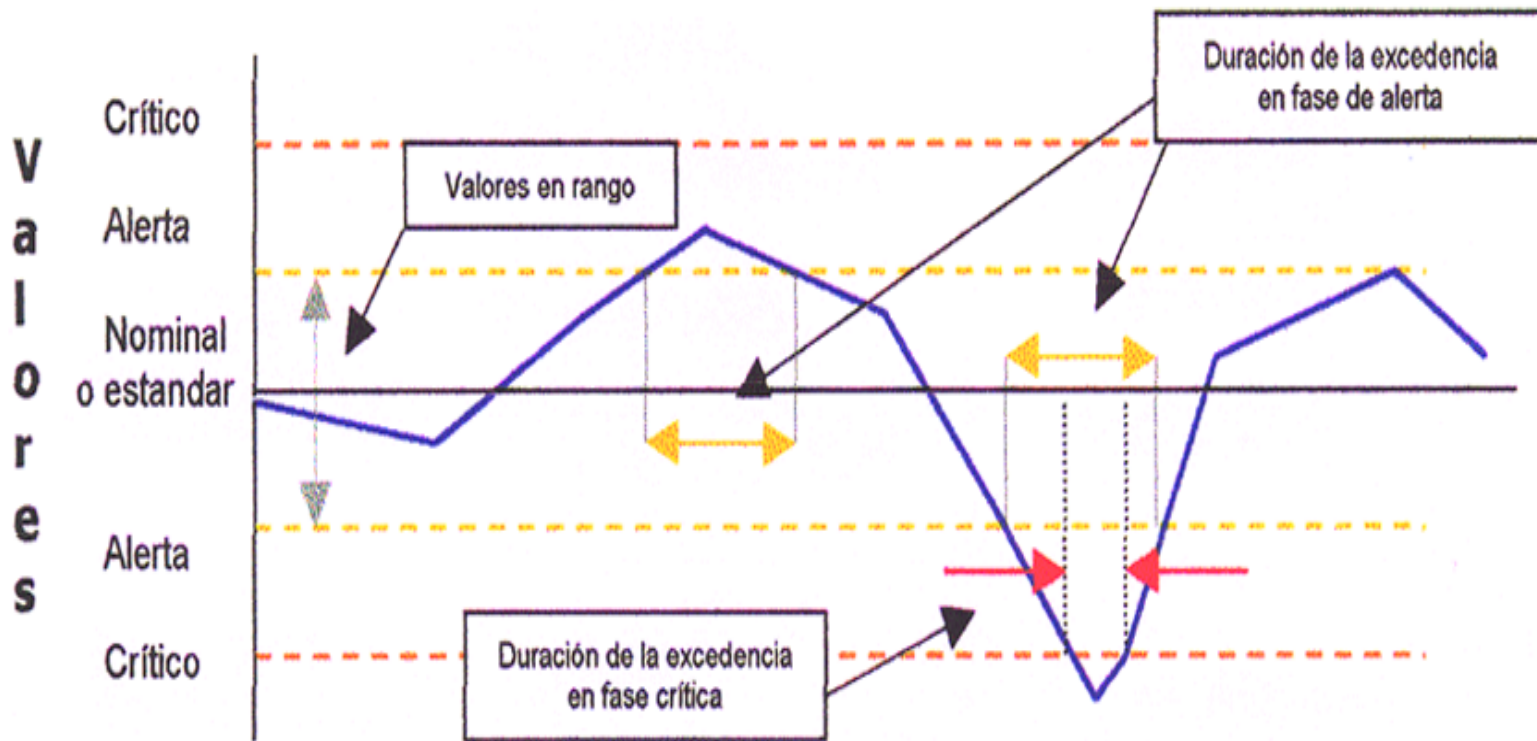


Nuevos usos

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Traditional use



NEW USES



- **EXTENSIVE MONITORING**

 - Search of new precursors.

 - Integration of new parameters.

- **NORMAL OPERATION MONITORING**

 - Fuel Savings

 - Detection of problems associated with the operation.

- **IMPROVEMENT OF TRAINING**

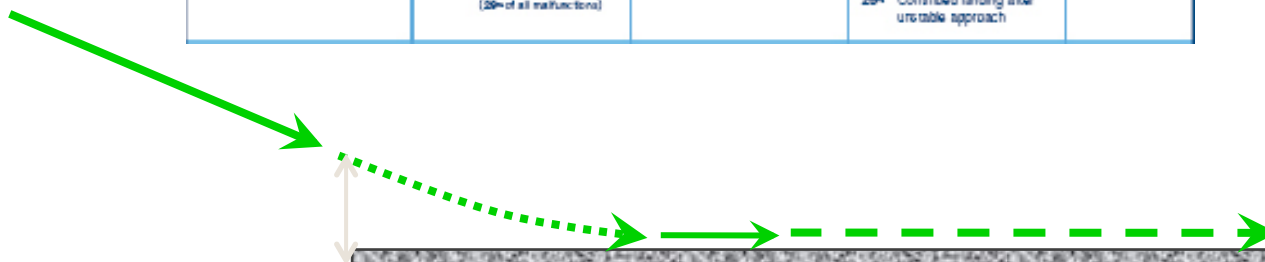
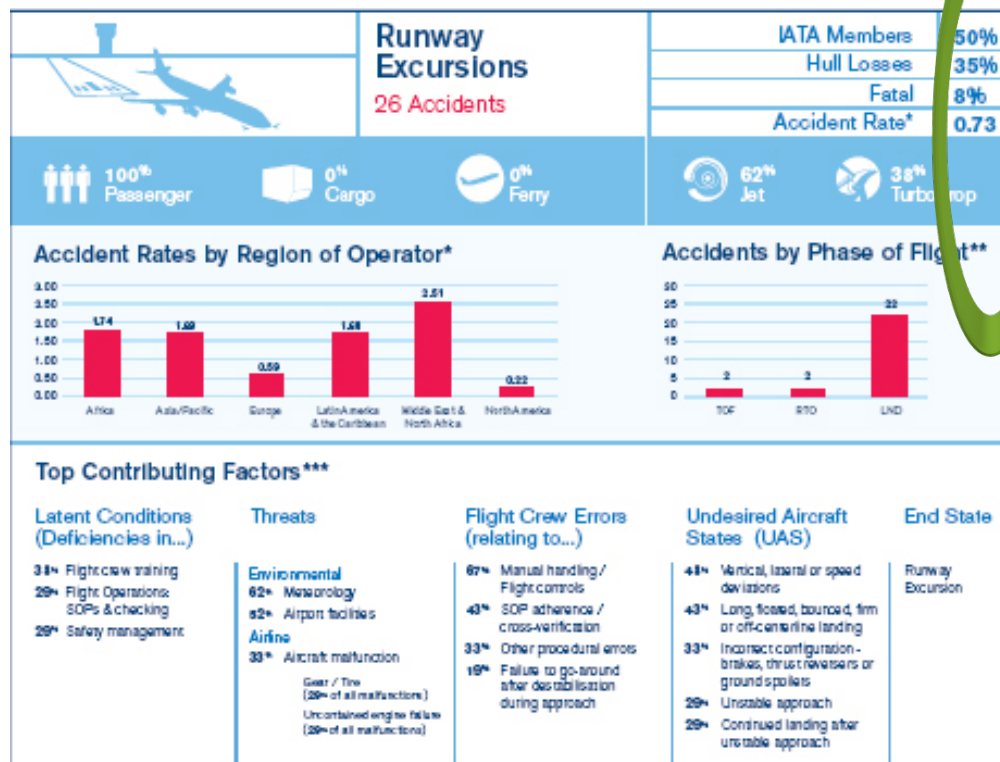
- **STUDY OF MAN-MACHINE INTEGRATION**

- **NEW INTERNATIONAL INITIATIVES**

EXTENSIVE MONITORING

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SALIDA DE PISTA = RUNWAY EXCURSION



Search of new precursors



RUNWAY EXCURSIONS

Basic Analysis

High speed

Height over
runway

Excessive roll

High vertical
speed

Continuous monitoring

Vertical Profile

Speed
monitoring

Trajectory
monitoring

Engine Power

Advanced monitoring

Long landings

Lateral
deviation on
runway

Use of brakes

Engine power
management

Extensive Monitoring

Tail wind

Glide slope
deviation

Touchdown
point

No sustained
landing

NORMAL OPERATION MONITORING

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FUEL SAVING



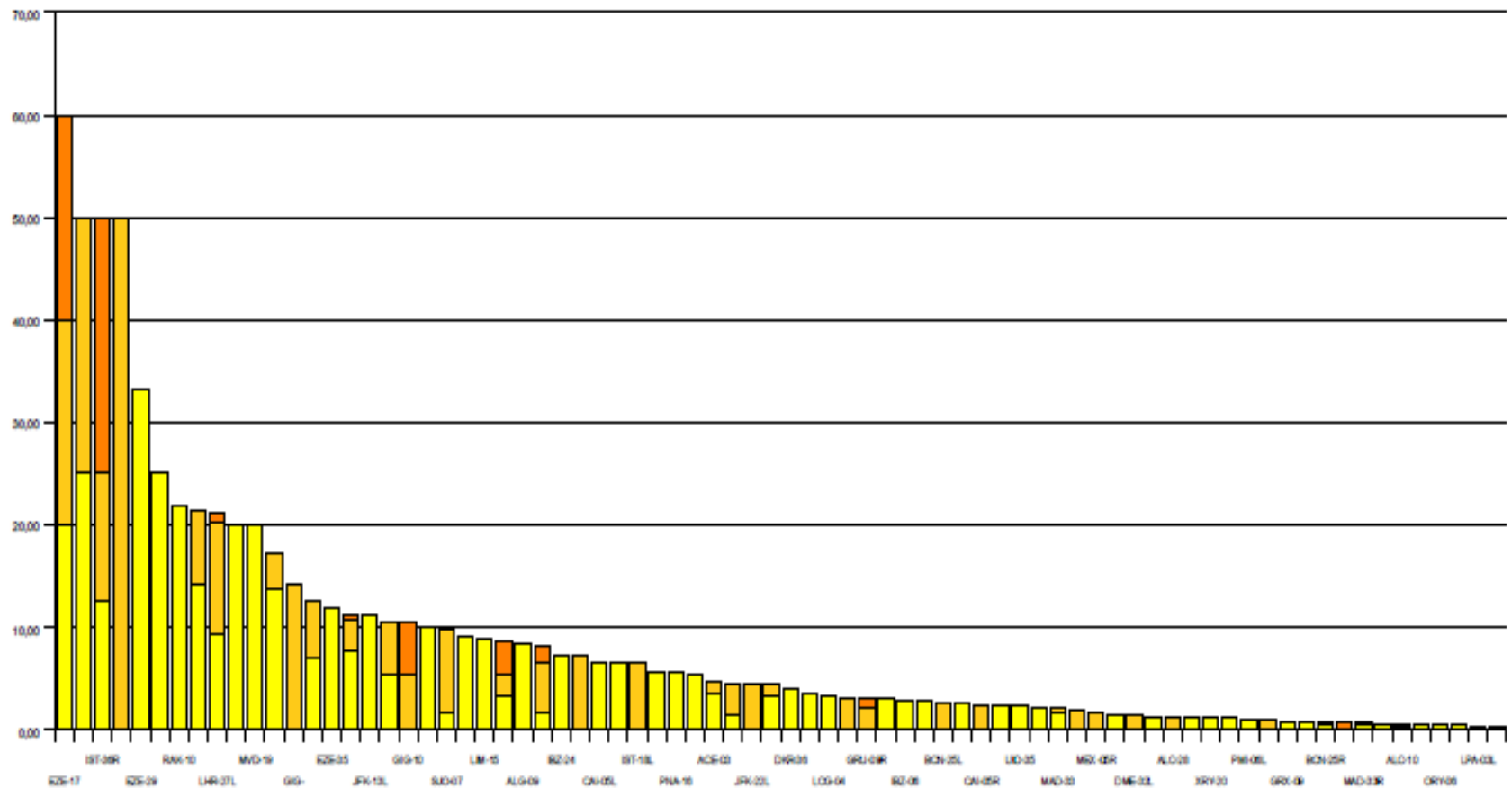
HOLDING DETECTION



FUEL SAVINGS



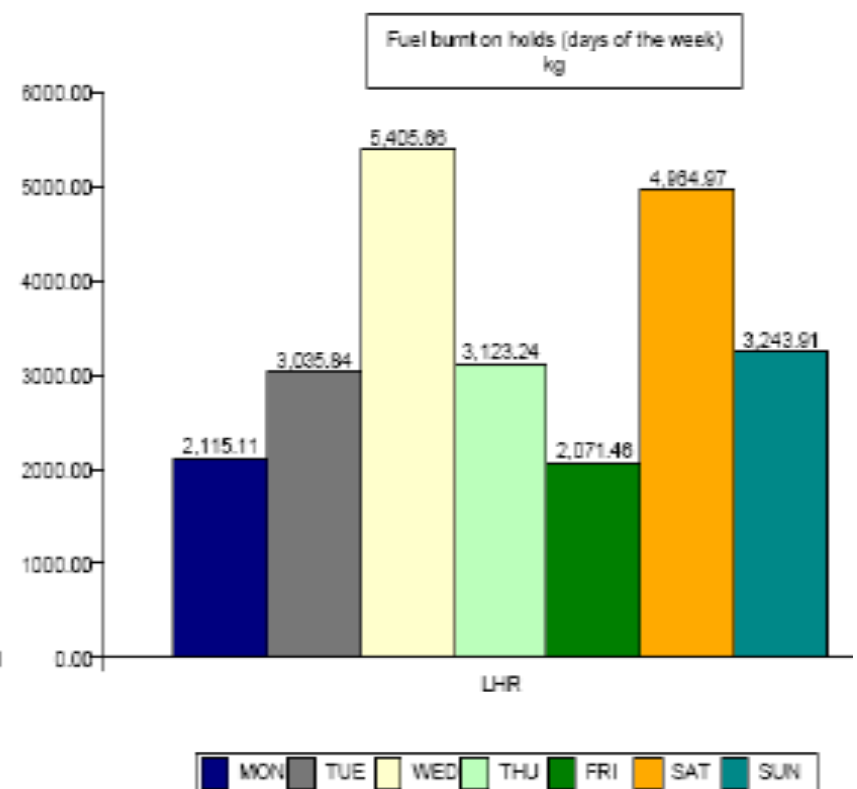
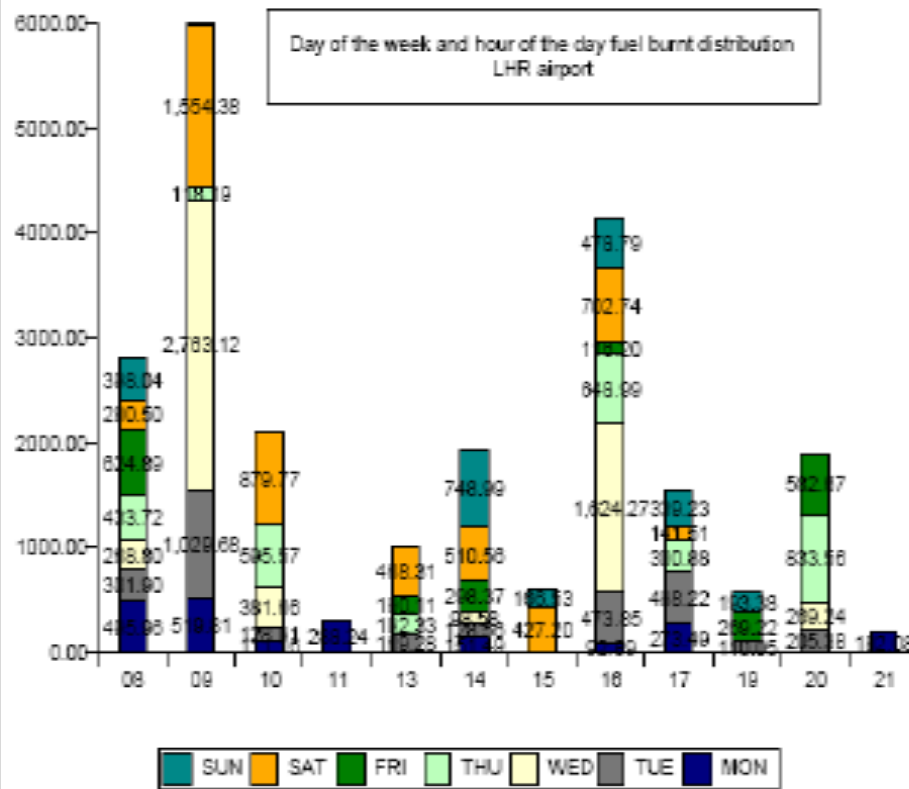
WHERE?



FUEL SAVINGS



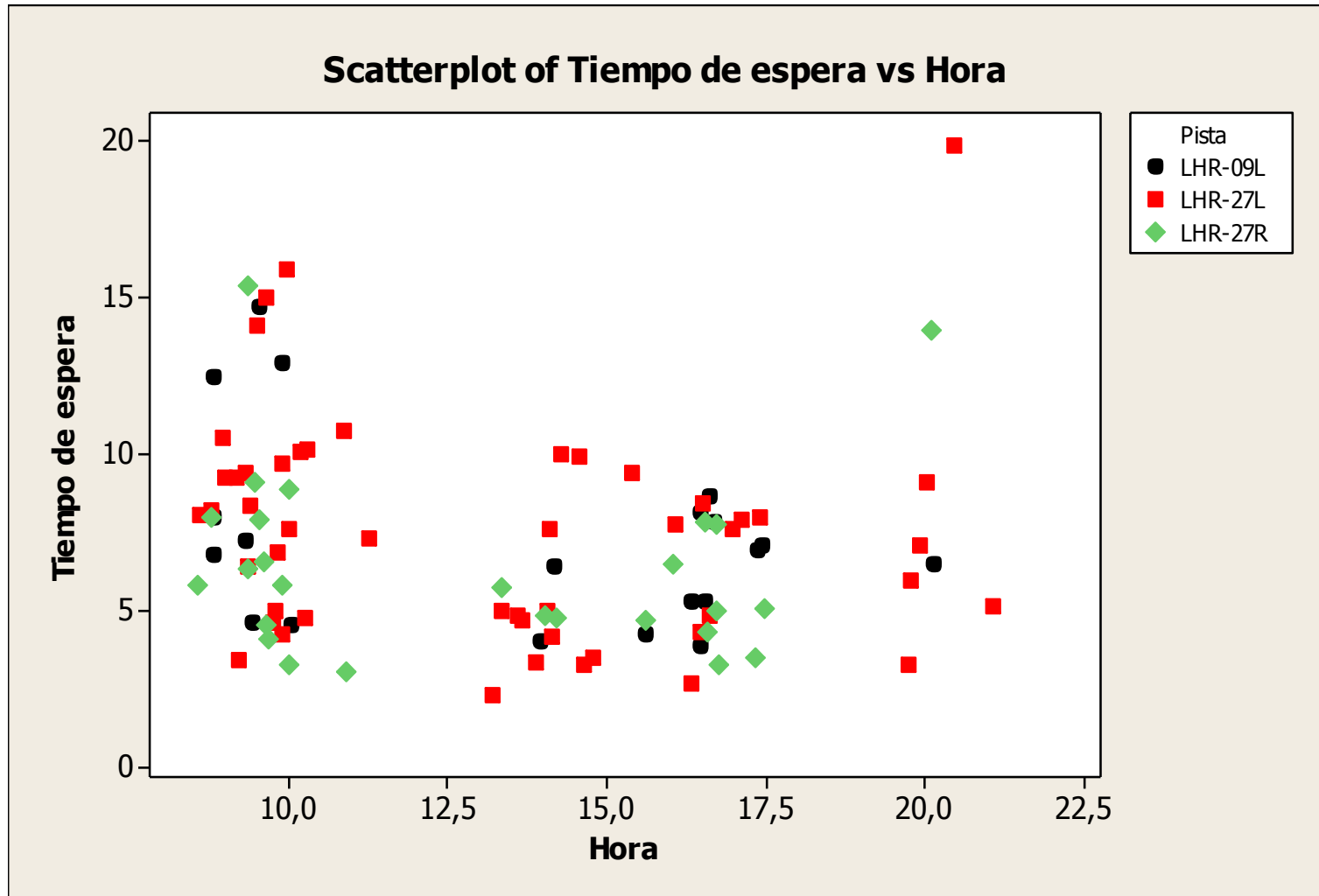
¿WHEN?



FUEL SAVINGS



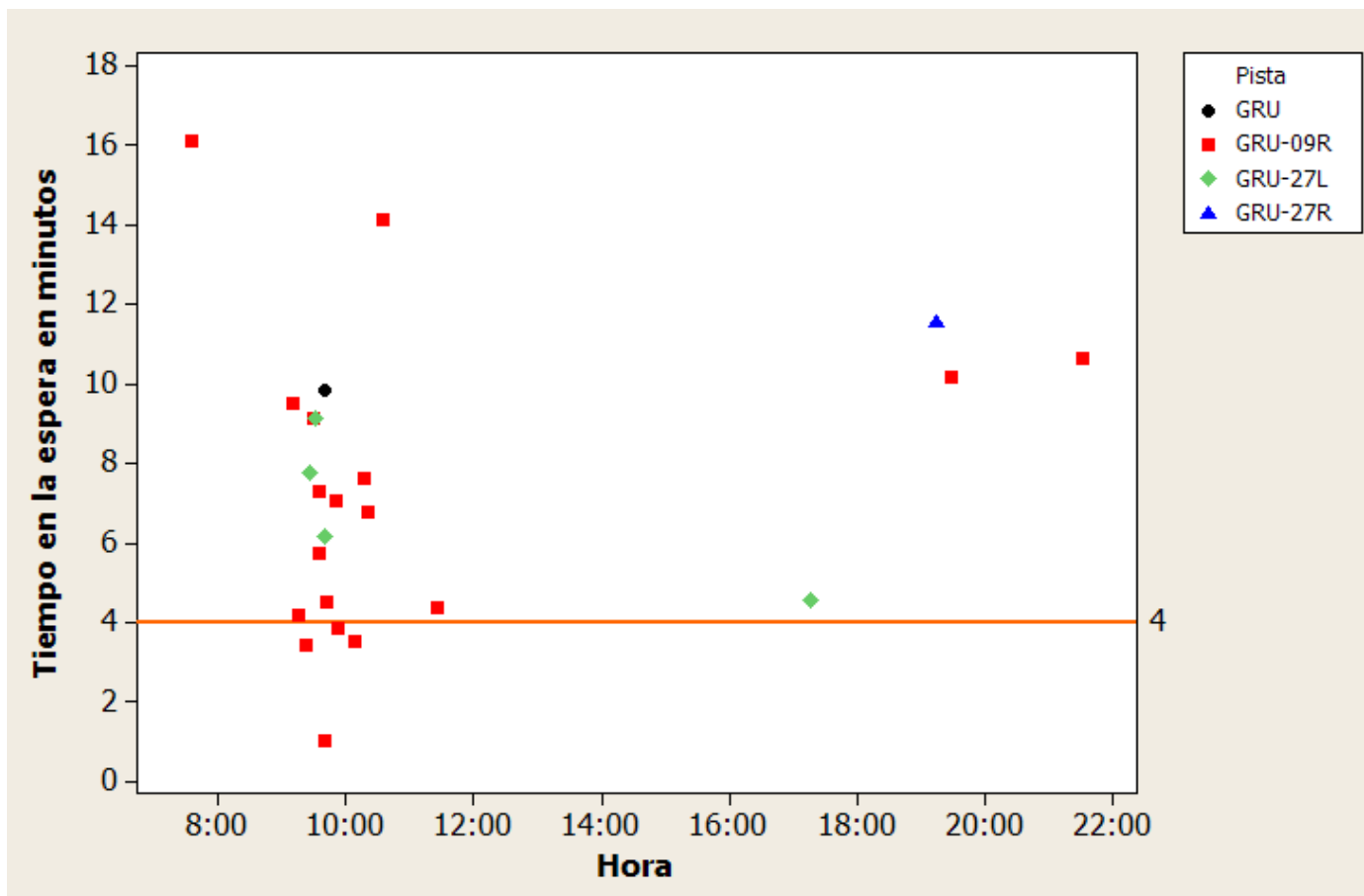
HOW LONG'



FUEL SAVINGS



AIRPORT CONFIGURATION



NORMAL OPERATION & SAVINGS

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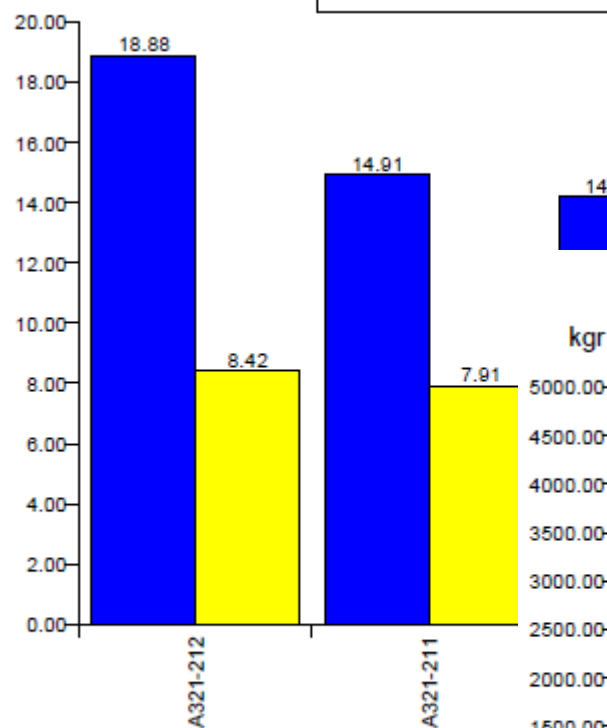


NORMAL OPERATION & SAVINGS

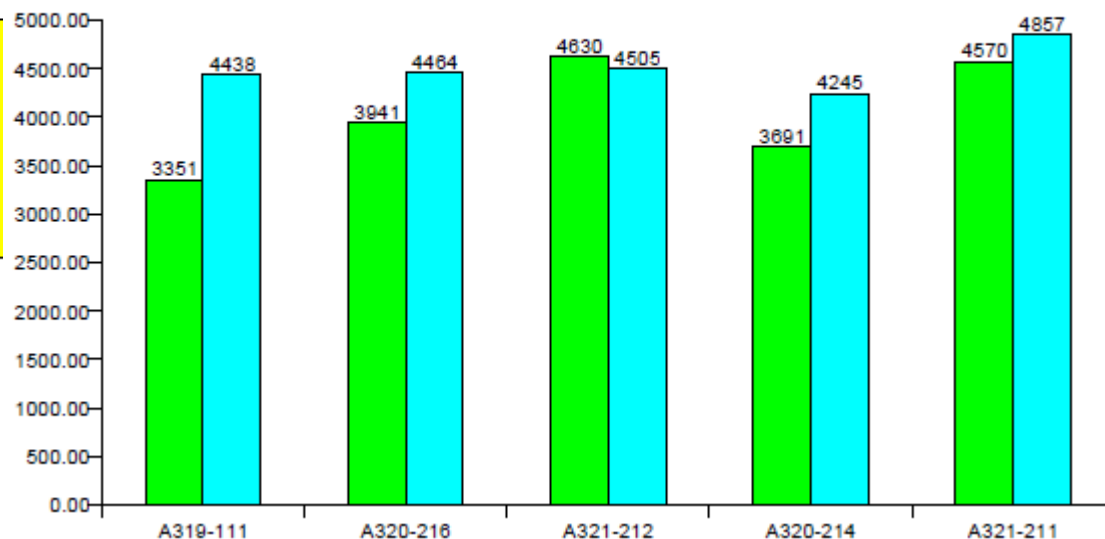


Combustible consumido por vuelo en la carrera de aterrizaje
Flota A320

Kgr



kgr

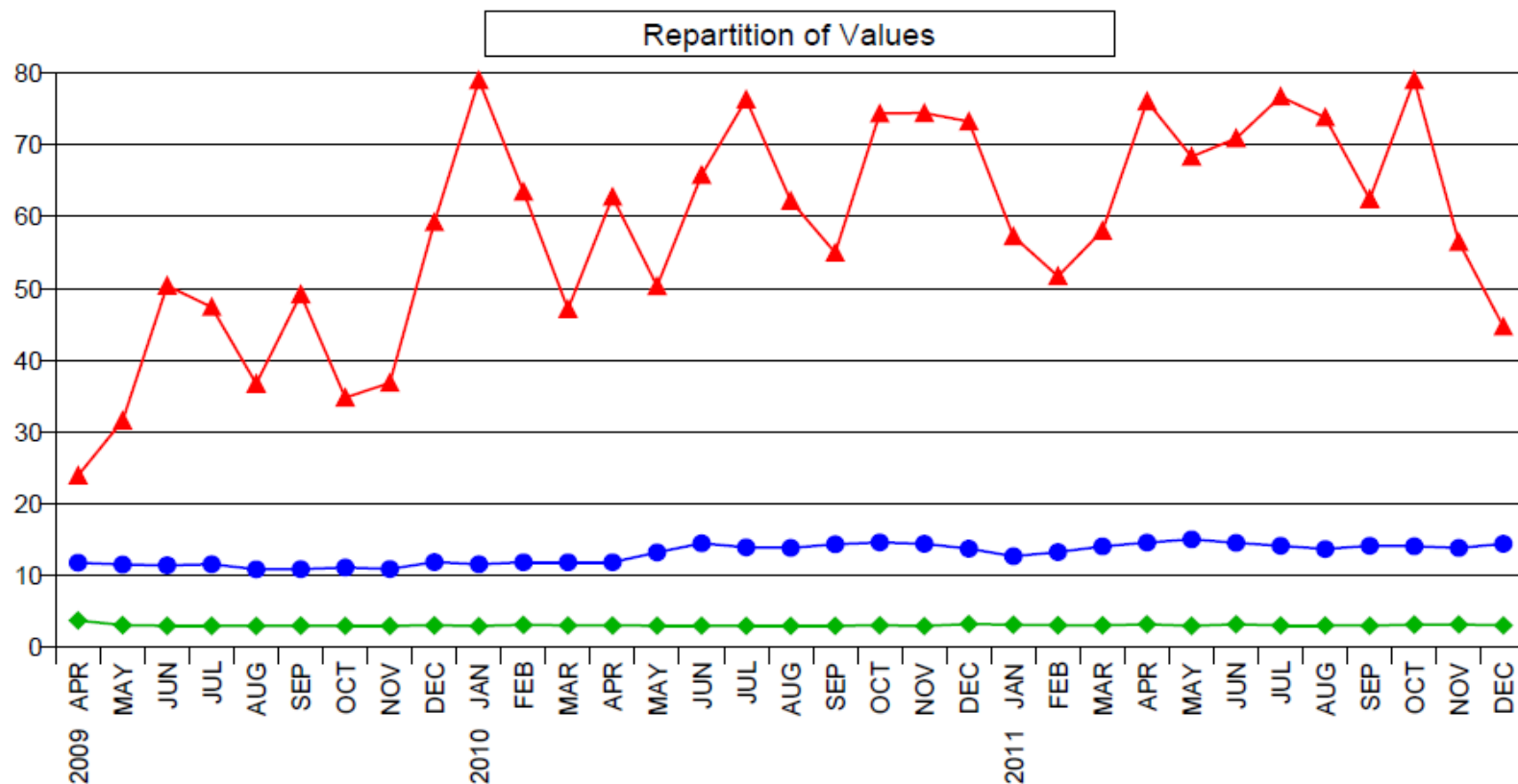


Consumo de combustible por 100 aterrizajes
Flota A320

NORMAL OPERATION & SAVINGS



Taxi out time min



TRAINING IMPROVEMENT



- TRAINING BASED ON NORMAL OPERATION.
- PERSONAL TRAINING
- FDA IN SIMULATION

TRAINING IMPROVEMENT



TRAINING BASED ON NORMAL OPERATION.

- EBT: EVIDENCE BASED TRAINING
 - Initiative of AIRBUS.
 - Study of the Normal operation.
 - Shortcomings of the operation.
 - Supplementing the shortcomings with training.



TRAINING IMPROVEMENT



PERSONAL TRAINING

- Individualized study of normal operation.
- Fill gaps.
- Tailor the training to the individual.



TRAINING IMPROVEMENT



FDA IN SIMULATION

- Study Group
- Individualized Study
- Debrief in 3D representation.
- Reproduction of the simulator session
- Training Analysis



Embraer Simulator
Simulateur Embraer

MAN- MACHINE INTEGRATION

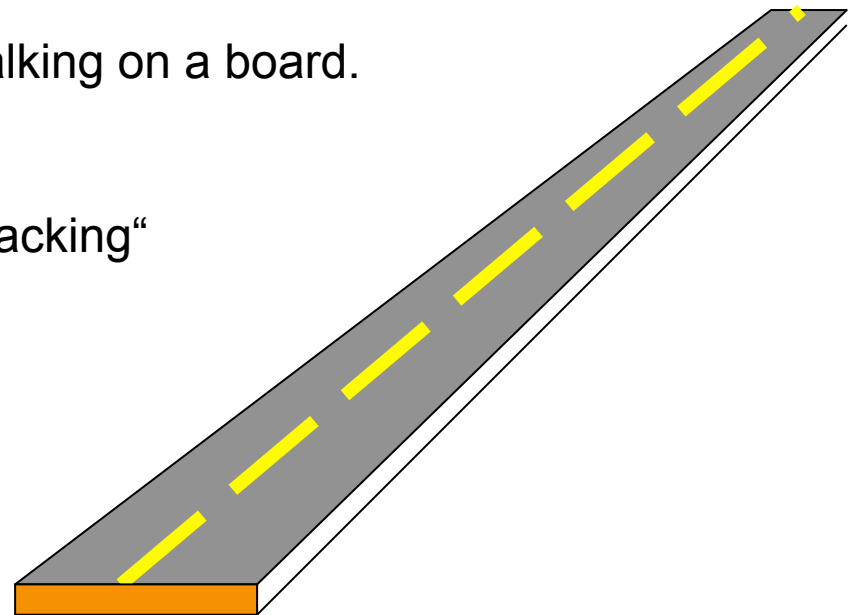
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Influence of the pilot overacting on hard landings and tail strike in adverse weather situations

Based on a study of the US Air Force
The runway has an effect similar to walking on a board.
Specially with strong cross wind

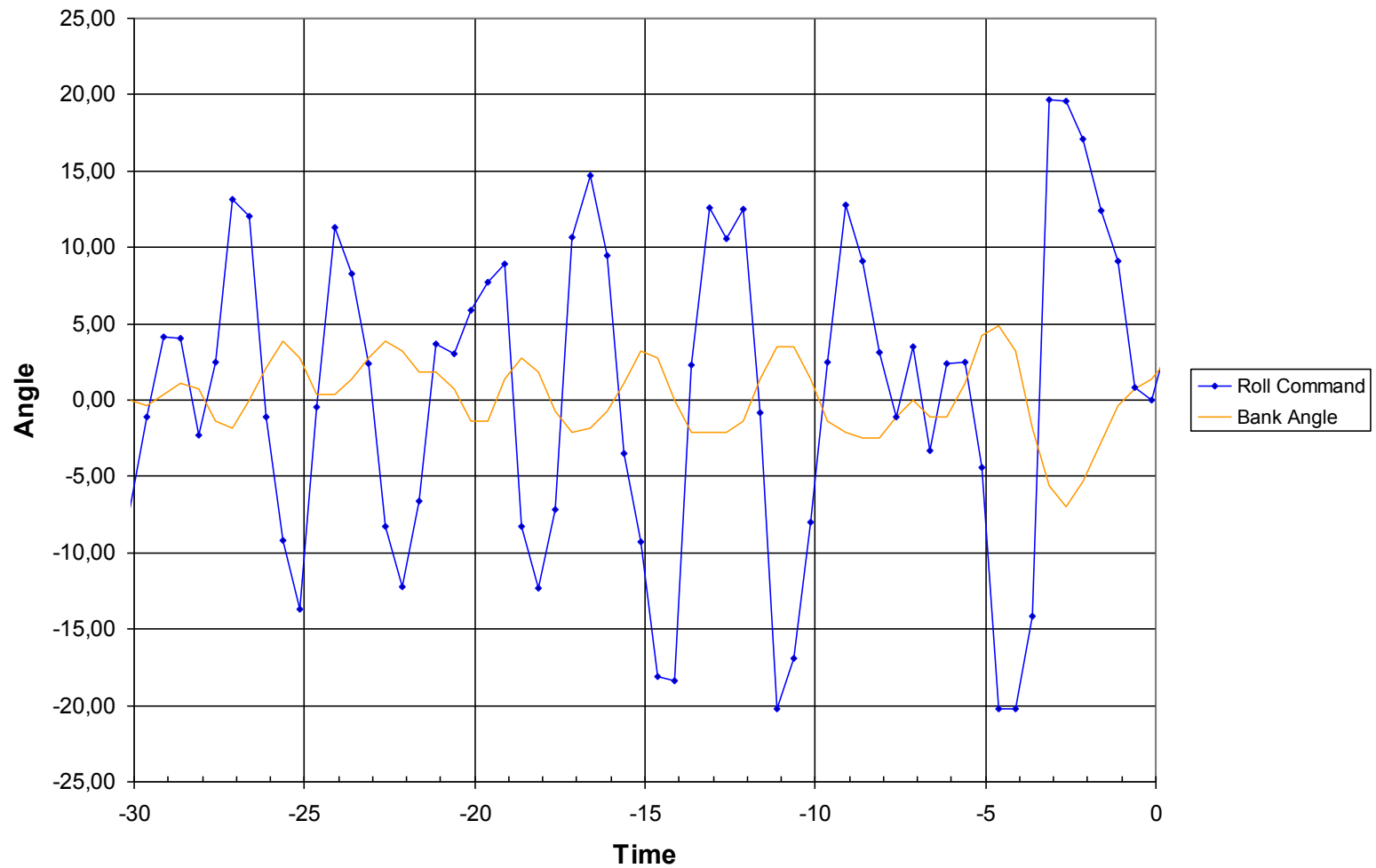
The outcome: “Boundary-avoidance tracking“



MAN- MACHINE INTEGRATION



Bank Angle vs. First Officer Roll Command

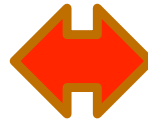
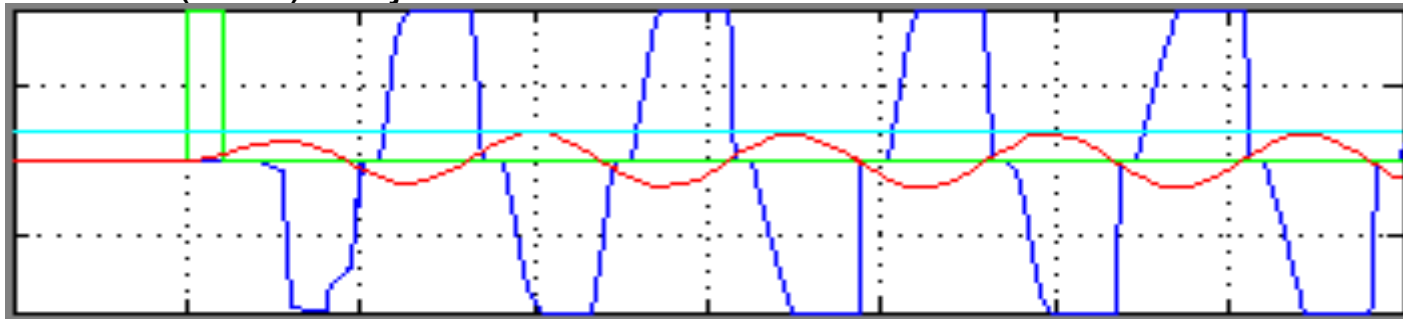


MAN- MACHINE INTEGRATION



Study on pilot monitoring instruments

- GRAZ University & AUSTRIAN AIRLINES
- HILAS (NLR) Project



MAN- MACHINE INTEGRATION

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NEW INTERNATIONAL INITIATIVES



NEW INTERNATIONAL INITIATIVES

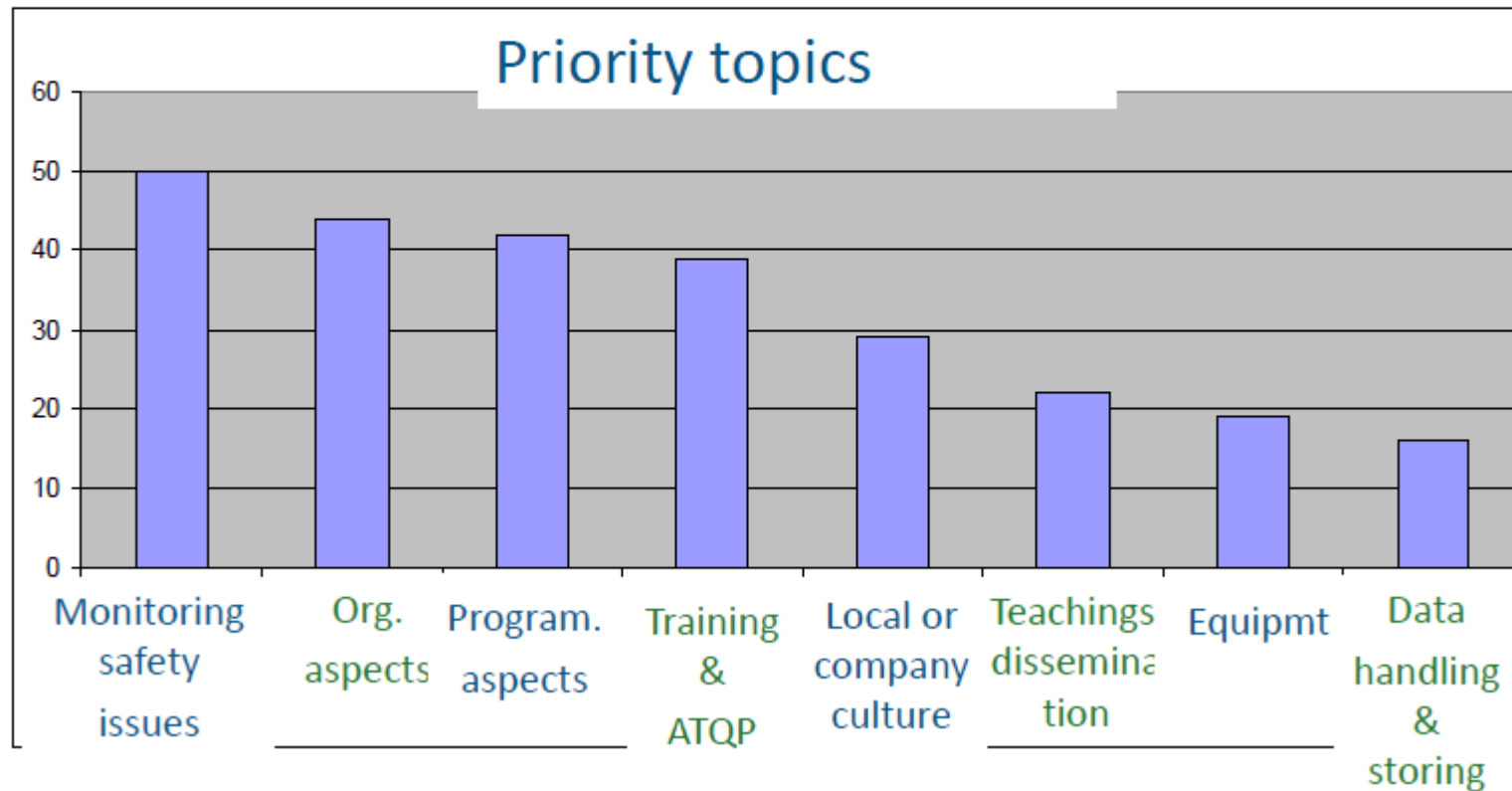


EUROPEAN AVIATION SAFETY AGENCY
AGENCE EUROPÉENNE DE LA SÉCURITÉ AÉRIENNE
EUROPÄISCHE AGENTUR FÜR FLUGSICHERHEIT

Progress report on the European Operators FDM Forum



II. Survey on EOFDM – Priority topics



NEW INTERNATIONAL INITIATIVES



GSIC - FDX

- The FDX (Flight Data Exchange) is a database of FDA/FOQA events from contributing airlines whereby unprocessed ARINC 717 data (raw data file as downloaded from the aircraft without having been processed by an in-house FOQA system such as Flightscape Insight | FDM, SAGEM AGS, Teledyne AirFase, etc) from their aircraft is processed by the IATA FDX team using one single event set. The data de-identification encompasses the following:
 - No airline information is available
 - The tail numbers are written off
 - The flight numbers are written off
 - The flight date is set to the first day of the month

NEW INTERNATIONAL INITIATIVES

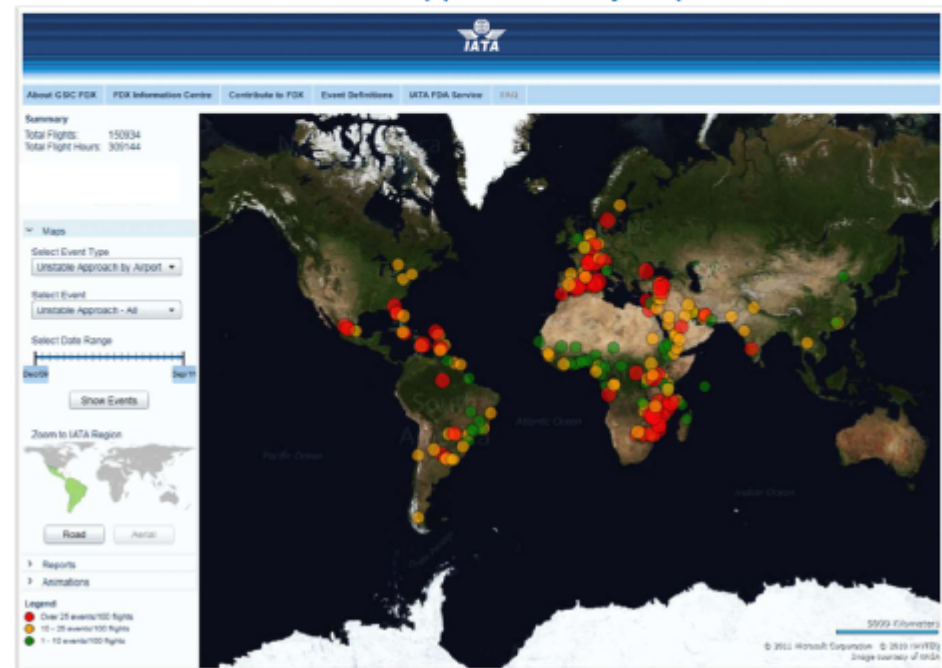


From January 2011

- + 20 Airlines
- 200.000 Flights:
 - Benchmarking
 - Airport Risk
 - Airport Familiarization
 - Specific Analysis



Unstable Approaches by Airport



NEW INTERNATIONAL INITIATIVES



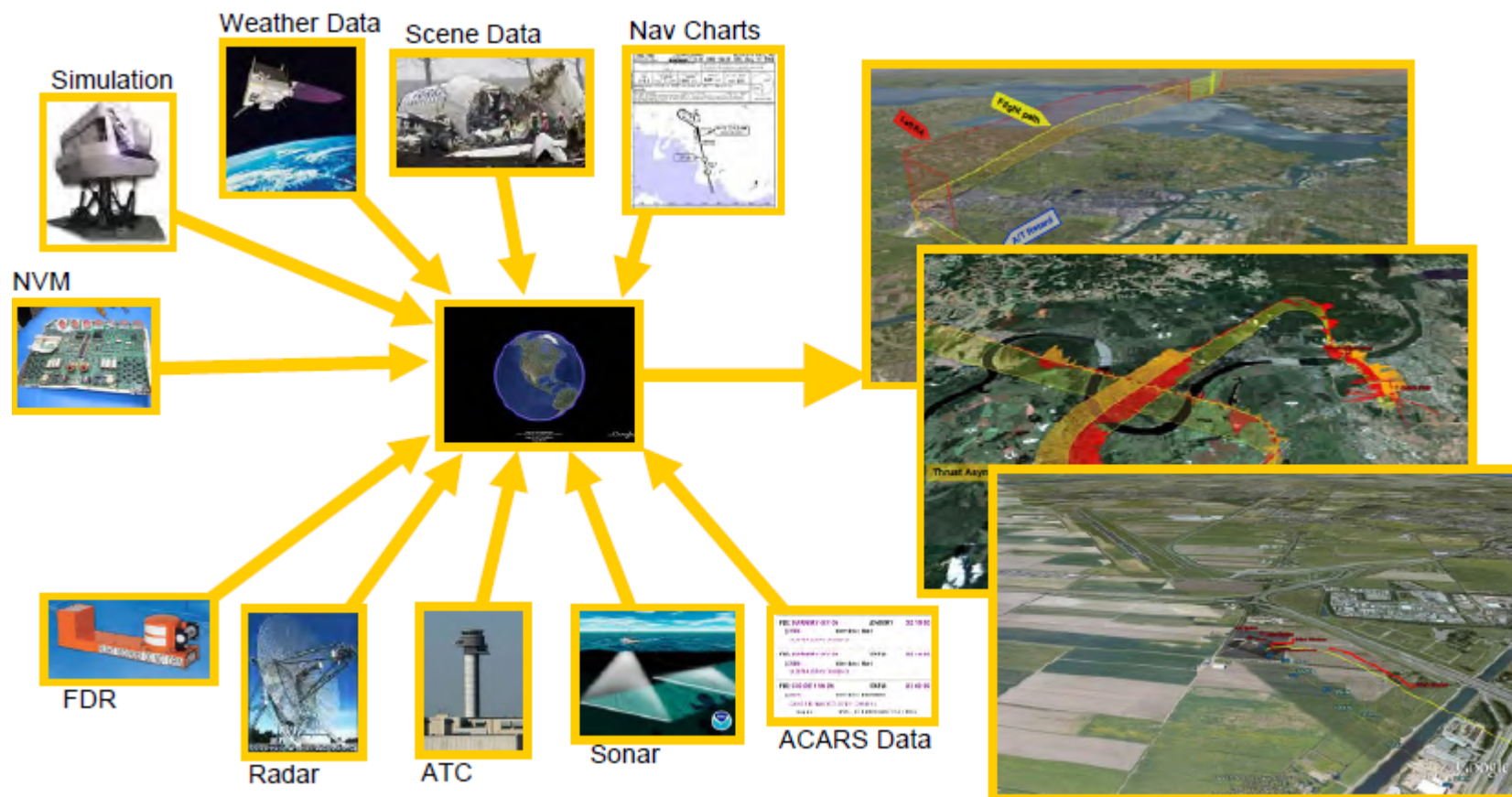
Ejemplo de análisis por aeropuerto del FDX de IATA



NEW INTERNATIONAL INITIATIVES



BOEING: Total Flight data integration



Where is the limit?



QUESTIONS

