EASA
European Union Aviation Safety Agency

This project is funded by the European Union
and implemented by EASA

Effective Aviation Safety Occurrence Reporting Systems: Implementation and Use in SSP/SMS

EU-Africa Safety in Aviation (EU-ASA) Project

Dates: 15–18 July

Online: Zoom

Pablo Hernández-Coronado Quintero

Your safety is our mission.

An Agency of the European Union

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Day 3 – Reporting Quality, Classification, and Risk Management

Module 9: Collection & Storage of Information

- → Quality and content of occurrence reports
- → Reporting format and data quality
- → ECCAIRS 2
- → SDCPS tools

Quality and Content of Occurrence Reports

This project is funded by the European Union and implemented by EASA

→ Applicable Regulation: Regulation (EU) No376/2014: Article 7

Minimum information required:

Occurrence reports shall contain at least the information listed in Annex I of Reg. 376/2014. Today, this information is divided in:

1) Common Mandatory Data Fields
2) Specific Mandatory Data Fields
    - → Aircraft
    - → Air Navigation Services
    - → Aerodrome
    - → Aircraft Damage or Personal Injuries

Quality and Content of Occurrence Reports

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→ Applicable Regulation: Regulation (EU) No376/2014: Article 7

1) Common Mandatory Data Fields:

- → Headline
- → Responsible Entity
- → File Number
- → Occurrence Status
- → UTC Date
- → State/Area of Occurrence
- → Location of Occurrence
- → Occurrence Class
- → Occurrence Category
- → Narrative Language
- → Narrative
- → Event Type
- → Risk Classification

Quality and Content of Occurrence Reports

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→ Applicable Regulation: Regulation (EU) No376/2014: Article 7

2) Specific Mandatory Data Fields: Aircraft

- → State of Registry
- → Make / Model / Series
- → Aircraft Serial Number
- → Aircraft Registration
- → Call Sign
- → Operator
- → Type of Operation
- → Aircraft Category
- → Propulsion Type
- → Mass Group
- → Last Departure Point
- → Planned Destination
- → Flight Phase
- → Weather Relevant

Quality and Content of Occurrence Reports

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→ Applicable Regulation: Regulation (EU) No376/2014: Article 7

2) Specific Mandatory Data Fields: Air Navigation Services

→ Airspace Type

→ Airspace Class

→ FIR / UIR Name

Quality and Content of Occurrence Reports

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→ Applicable Regulation: Regulation (EU) No376/2014: Article 7

2) Specific Mandatory Data Fields: Aerodrome

→ Location Indicator

ICAO indicator of the Airport

→ Location on the aerodrome

Quality and Content of Occurrence Reports

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→ Applicable Regulation: Regulation (EU) No376/2014: Article 7

2) Specific Mandatory Data Fields: Aircraft Damage or Injuries

- → Highest Damage
- → Injury Level
- → Number of injuries on ground

  Fatal – Serious – Minor
- → Number of injuries on aircraft

  Fatal – Serious – Minor

Quality and Content of Occurrence Reports

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→ Applicable Regulation: Regulation (EU) No376/2014: Article 7

Risk Assessment:

Occurrence reports shall include a safety risk classification.

That classification shall be reviewed and if necessary amended and shall be endorsed by the competent authority in accordance with the common *European Risk Classification Scheme* (ERCS) defined by the European Commission.

ERCS will enable the organisations, Member States and the Agency to classify occurrences in terms of safety risk in a common framework. Its implementation is also tutored by the European Commission.

Reporting format and data quality

This project is funded by the European Union and implemented by EASA

→ Applicable Regulation: Regulation (EU) No376/2014: Article 7

Data Quality

"Organisations, Member States and the Agency shall establish data quality checking processes to improve data consistency, notably between the information collected initially and the report stored in the database."

This does not only apply to the consistency of the final information, but it also applies to the completion of missing fields as, as authorities, we and EASA are responsible of the coherence, completion and capacity of the reports to be analysed.

Reporting format and data quality

This project is funded by the European Union and implemented by EASA

→ Applicable Regulation: Regulation (EU) No376/2014: Article 7

Data Quality

The Commission and the Agency shall support the competent authorities of the Member States in their task of data integration, including:

a) The integration of the minimum information required;
b) The risk classification of occurrences; and
c) The establishment of data quality checking processes.

Reporting format and data quality

This project is funded by the European Union and implemented by EASA

→ Applicable Regulation: Regulation (EU) No376/2014: Article 7

Data Quality

The Commission and EASA shall provide that support in such a way as to contribute to the harmonisation of the data entry process across Member States, by providing :

a) Guidance material;
b) Workshops; and
c) Appropriate training.

Reporting format and data quality

This project is funded by the European Union and implemented by EASA

→ Applicable Regulation: Regulation (EU) No376/2014: Article 7

Compatibility

The information should be compatible with the European Coordination Centre for Aircraft Incident Reporting Systems (ECCAIRS). ***This is maintained for ECCAIRS2***.

Information Exchange Requirement

The reports should be written in compliance with ICAO's Aviation Data Reporting Program (ADREP) taxonomy.

Reporting format and data quality

This project is funded by the European Union and implemented by EASA

→ Applicable Regulation: Regulation (EU) No376/2014: Article 7

Formats

- Compatible .pdf forms
- Compatible .E5X files.
- By filling an online webform (Eccairs2)
- Other

Ways to report

- Through E2 Reporting Portal
- M2M Technology

ECCAIRS2

This project is funded by the European Union and implemented by EASA

A bit of history:

After a Feasibility and Impact Analysis, DG Move (Directorate-General of the Commission for Mobility and Transport) decided that it was time to transfer the management of ECCAIRS* from the JRC to EASA on the basis that ECCAIRS needed to be restructured to reduce costs.

Problems described by EASA when picking up ECCAIRS:

- EASA does not have enough resources, and they need a solution that is easier to maintain.
- The project was not aligned with EASA's IT strategy.
- It's today considered as based on outdated technology
- Difficult or uncomfortable interaction with the user community.

Key features:

- Simpler and more intuitive for users
- Web-based (no local installation)
- Centralized database
- Using Modern Interface Design Principles
- Using Open Source technologies
- Possibility of adapting it in the future to other types (railway, sea...)
- Portable to non-EASA authorities
- Integration with the Data4Safety project

*European Coordination Centre for Accident and Incident Reporting Systems

ECCAIRS2

This project is funded by the European Union and implemented by EASA

Two taxonomies:

- ADREP: Accident/Incident Data Reporting
- SRIS: Safety Recommendation Information System

Two ECR (European Central Repositories) databases that need to interact:

- ECR-ECCAIRS*: For events, required by Reg. 376/2014
- ECR-SIRS*: For safety recommendations, required by Reg. 996/2010

Two purposes:

- Integration of original reports from multiple sources
- Offer a common solution to several member states that do not have their own automatic system

The following are not included but were considered:

- **EMSA**: European Maritime Safety Agency
- **ERA**: European Railway Agency

ECCAIRS2

This project is funded by the European Union and implemented by EASA

Involving:

No	Stakeholder	Internal/ external
1	EASA	Internal
2	Member States (Authorities SIA/NAA)	External
3	JRC	External
4	DG Move	External
5	ICAO	External
6	All External authorities using ECCAIRS today	External

Governance:

EC2 governance is assigned to the ECCAIRS Steering Committee (ESC, Annual Meeting)

From within the ESC, up to 9 representatives are selected who are in charge of the operational governance of EC2 and who make up the ECCAIRS Steering Board (ESB, Meeting every quarter).

EUROPEAN COMMISSION (DGMOVE)

EASA

NATIONAL AUTHORITIES

ECCAIRS2

This project is funded by the European Union and implemented by EASA

Concept	Definition
Attribute	An attribute is the minimum unit of information about an event, so every event can be defined and characterized by a list of attributes.
Entities	Entities are used to represent concepts to which we can associate a list of attributes. An entity can be, for example, the "aircraft(s)", "airport", etc. involved in the occurrence, or related to the description of the occurrence. As expected, there may be more than one entity involved in the event. In addition, each entity may contain dependent or lower-ranking entities (“sub entities"). E.g. Such as the characteristics of the Engine or the Propeller with respect to the higher entity "Aircraft".
Object	A system object refers to any operation that can be executed in ECCAIRS2, examples of objects are: queries, batch operations, quality rules, etc.
Occurrence (OC)	The final record of an occurrence is listed under the "Occurrences" panel in ECCAIRS2, and it refers to the main record of the data of an event within the reporting system.
Original Report (OR)	An original report (OR) is the description of the occurrence as presented by the original reporter. This record is not editable by the authority and will never be shared with the ECR.
Record	A record refers indistinctly to: Original Reports (ORs), Validated Reports (VRs), Occurrences (OCCs) or Safety Recommendations (SRs). Some records can exist in several versions: Minor, Major, Draft. Each of which has its own operating characteristics.

ECCAIRS2

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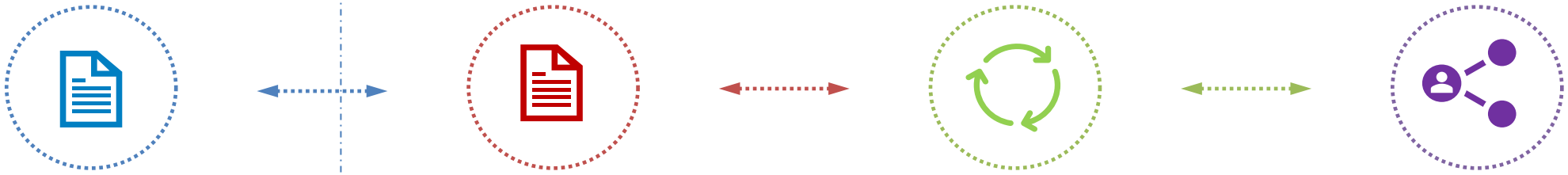
REPORTER ← → AUTHORITY



Pre-OR

The Original Report is generated by the reporter using any of the available means.

The portal can be used to retrieve a previously generated report and submit updates or work on draft versions.

OR

That OR is accessible from the E2 web app in read-only format.

The authority must then validate the OR or archive it.

VR

The OR, once validated is considered a VR, both records are linked.

This record is editable and, once processed by the authority, must be incorporated into a OC.

A conflict notice will be generated if the data conflicts with previous data or if an update is detected.

OC

Occurrence Reports are shared with the ECR in its latest Major version.

They can be linked to one or more VRs that are not visible from the ECR.

ECCAIRS2

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Concept	Definition
Safety Recommendation (SR)	They refer to the proposals of the authorities in charge of the investigation of accidents or serious incidents based on the information collected in order to prevent accidents or incidents and that, in no case, are intended to generate a presumption of guilt or responsibility for an event.
Section	A section is a series of related attributes that describe a subdomain of a record.
Taxonomy	The taxonomy is the catalog of information that describes what information can be stored in the ECCAIRS system and how this is encoded in the data fields.
Topic	A topic is a specific group of attributes linked to an event that can be viewed by a user role. Several sections can be grouped under the same topic.
Validated Report (VR)	A Validated Report is an Original Report (OR) that has been copied into the national authority's database in EC2. It can't be shared with the ECR and is editable, it can also be converted into an occurrence record (OC).
View	A view is the visual representation of the ordered data (in attributes) for easy analysis. They are groupings of topics placed in a hierarchical sequence. The views to which the users have access will depend on which repository they are connected to, but it will also depend on the users' assigned role(s). It is important to note that views and topics only change the way information is presented. The OCs generated in a specific view can be viewed with any other view, since the attributes containing the information are not affected.

ECCAIRS2

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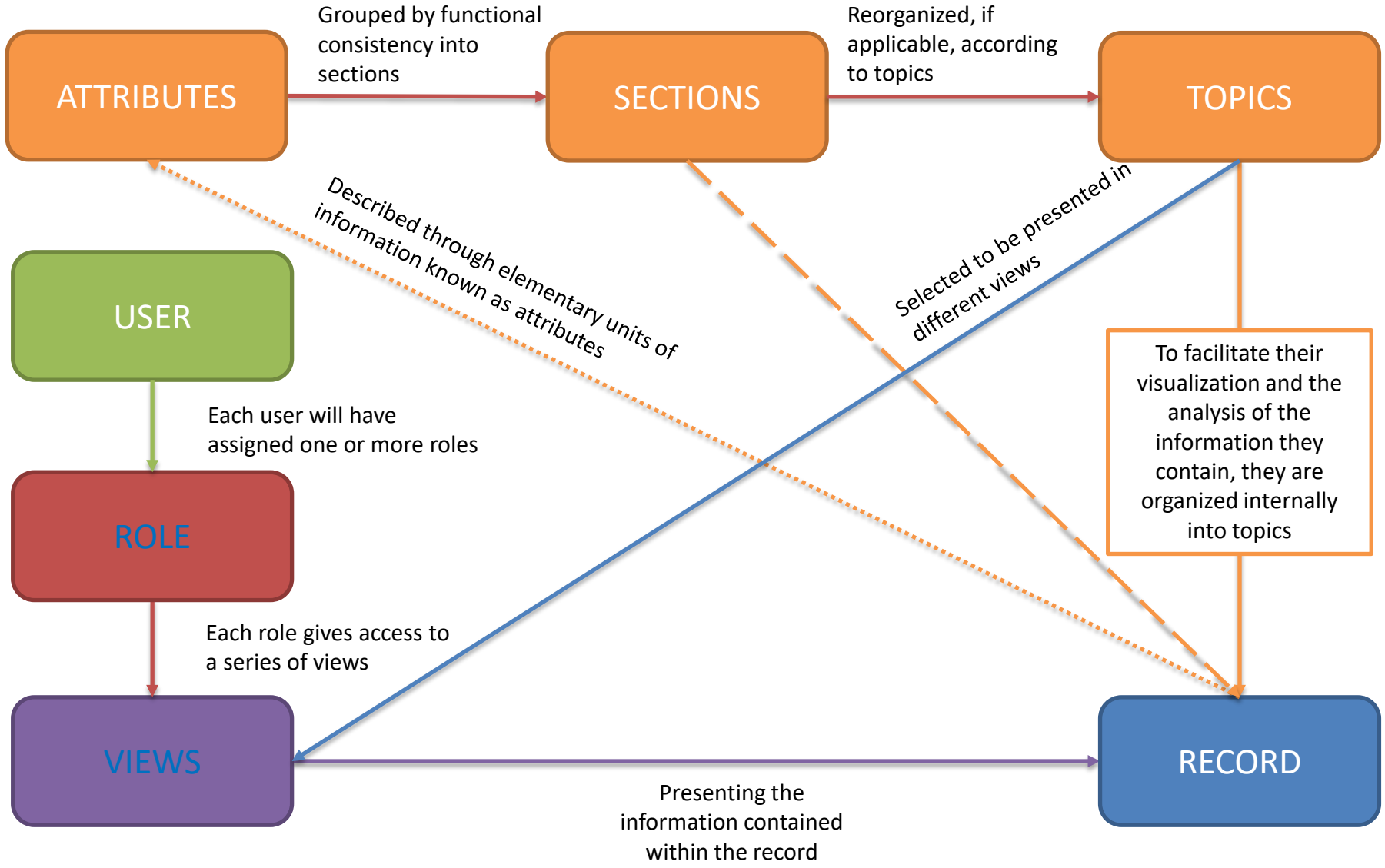

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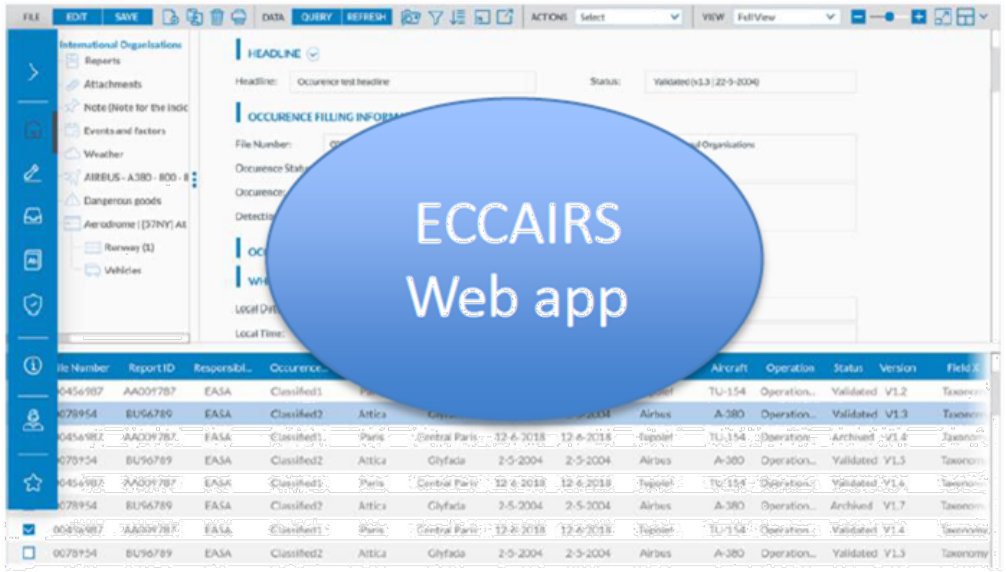

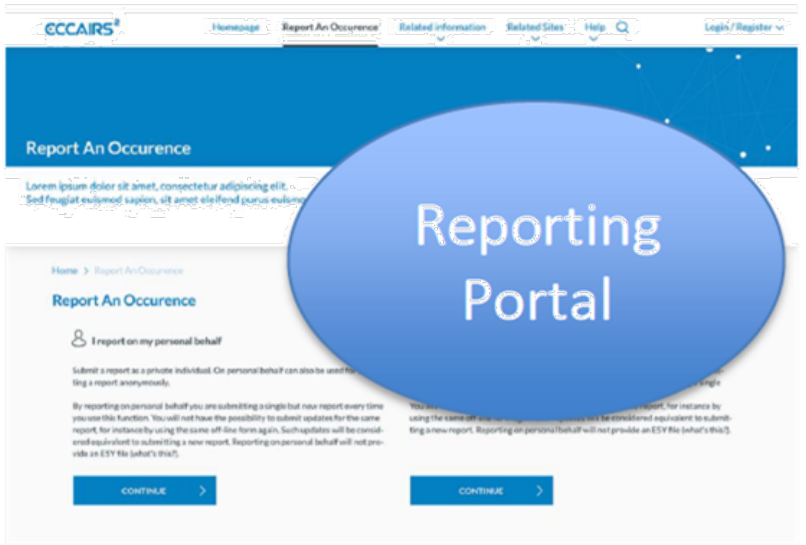

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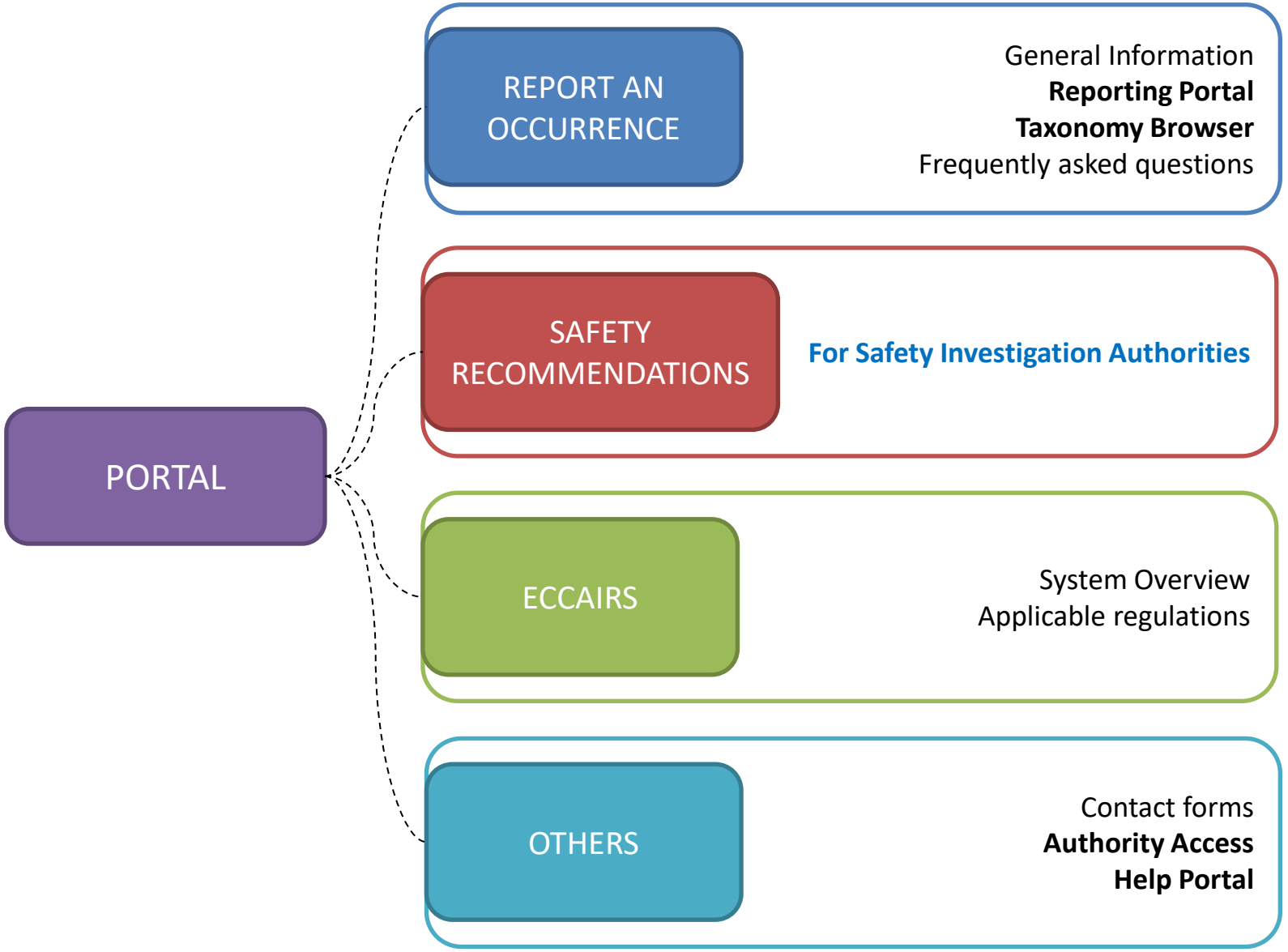

[ECCAIRS 2 Central Hub | Contact us]

SDCPS tools

This project is funded by the European Union and implemented by EASA

Remember

An SDCPS is considered the foundation for the analysis of safety data and safety information and is a key enabler of an organization's safety intelligence capability.

Elements

a) data collection;

b) data import;

c) database(s);

d) data processing;

e) data output; and

f) data pipeline.

SDCPS tools

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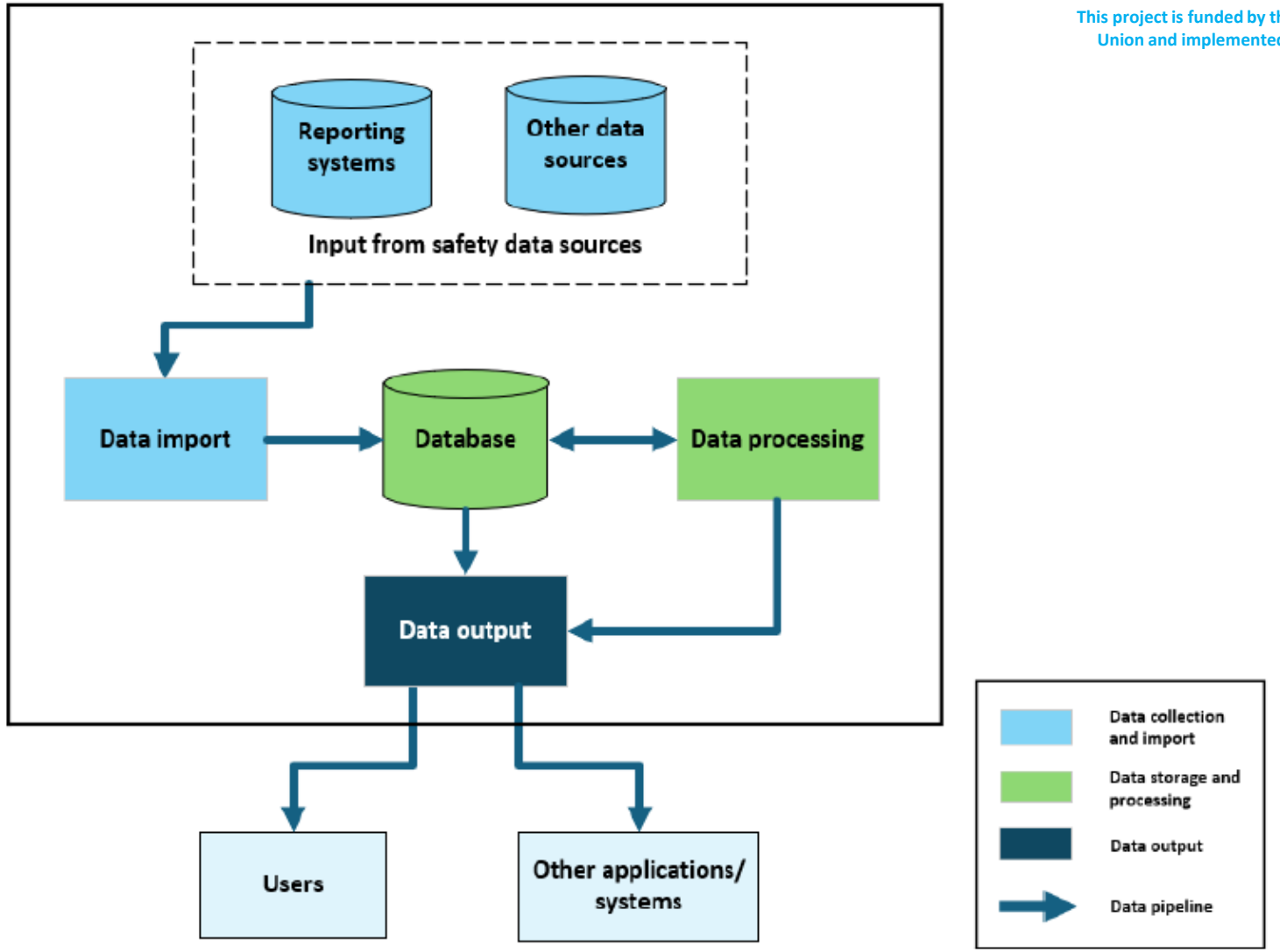
Data Sources



SDCPS tools

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Key Principles for Managing an SDCPS

An SDCPS is considered the foundation for the analysis of safety data and safety information and is a key enabler of an organization's safety intelligence capability.

- A true **Safety Data Collection and Processing System (SDCPS)** goes beyond a database—it must include:
  - ✓ Data **processing**, **analysis**, and **output** functions
  - ✓ Support for **safety risk management** and **decision-making**
- SDCPS can be developed **in-house** or with **third-party solutions**
- May include **mechanisms to share and exchange** safety information
- Can be **cloud-based** or provided as **software-as-a-service (SaaS)**
- Must operate under a **data governance framework** defining:
  - ✓ Access control, roles, and responsibilities
  - ✓ Data protection rules across all life-cycle stages
  - ✓ Standardized taxonomies for compatibility and analysis

SDCPS tools

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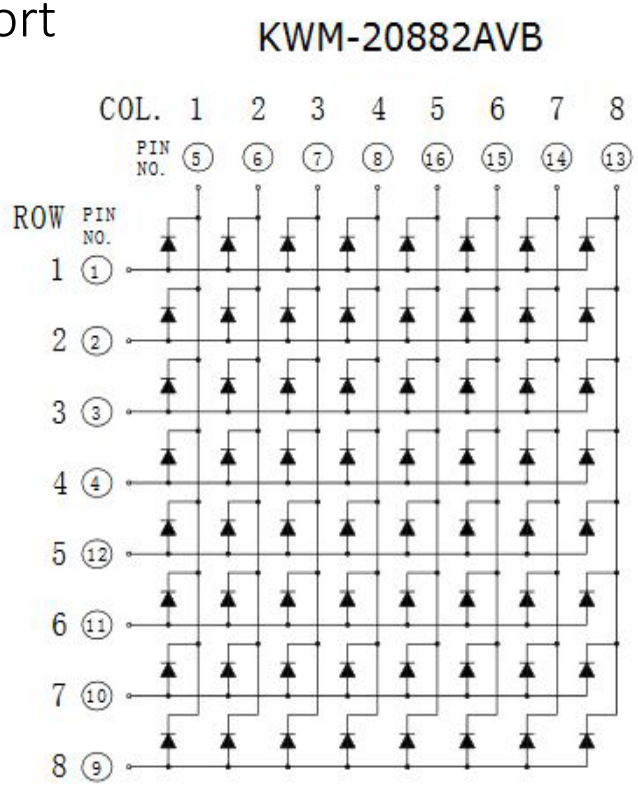
Setting Up an Effective SDCPS

- SDCPS should match the size, complexity, and needs of the organization
  - ✓ Small datasets → simpler, manual in-house systems may suffice
  - ✓ Complex, multi-source data → consider automation and vendor support
- Key implementation steps:
  - ✓ Identify stakeholders and their reporting needs
  - ✓ Define available and required data sources
  - ✓ Choose platform (e.g., SQL, Excel, AWS)
  - ✓ Design input forms, storage structure, and outputs (e.g., SPIs, dashboards)
  - ✓ Ensure data protection and security
  - ✓ Populate with historical data, if available
  - ✓ Establish governance policies for quality and updates
  - ✓ Provide training to staff
- Must be scalable and flexible to accommodate future needs and growth



SDCPS tools

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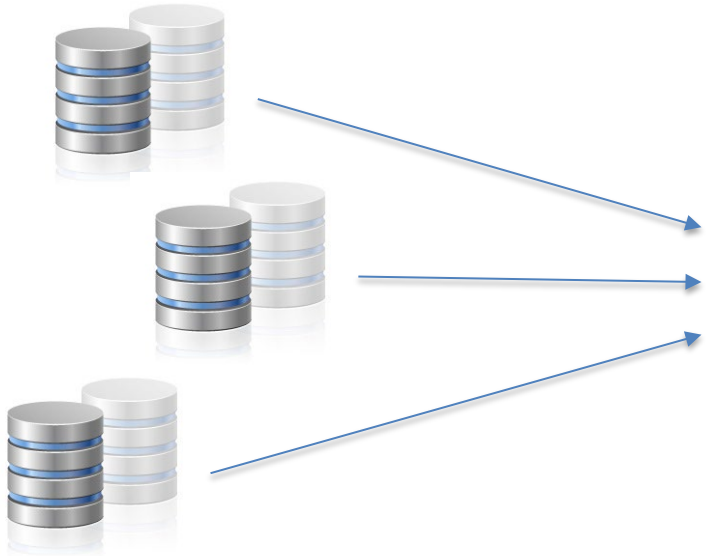
→ Methodologies of safety data analysis



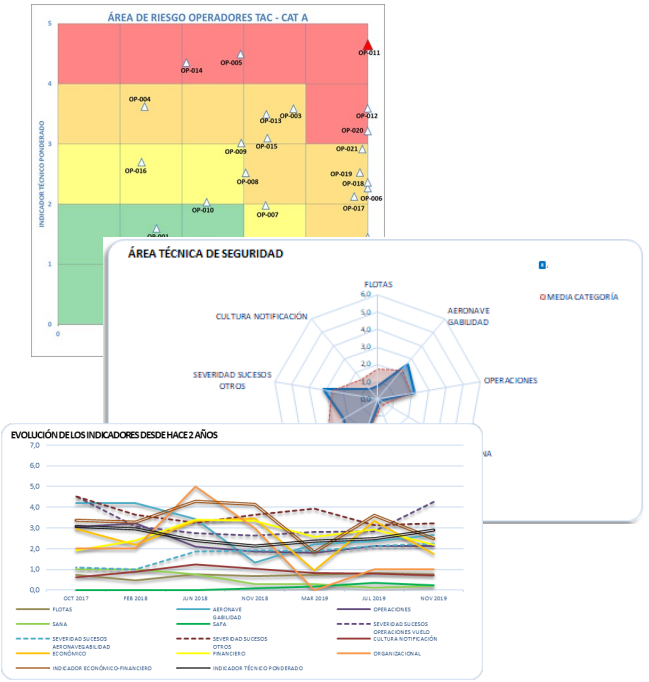
Data sources

$$i_{het} = 5 * \frac{(\sum TC + 0,3 * \sum NM - 1,3)}{N}$$

$$i_{ramp} = 2 \cdot \frac{i_{SANA} \cdot n^{o}insp_{SANA} + i_{SAFA} \cdot n^{o}insp_{SAFA}}{n^{o}insp_{SANA} + n^{o}insp_{SAFA}}$$

$$i_{sev} = \frac{(\sum_{sucesos} Coef\ Severidad \cdot Coef\ Tiempo)}{Coef\ Volumen\ Ops}$$

Metrics and indicators



Graphics and dashboards

SDCPS tools

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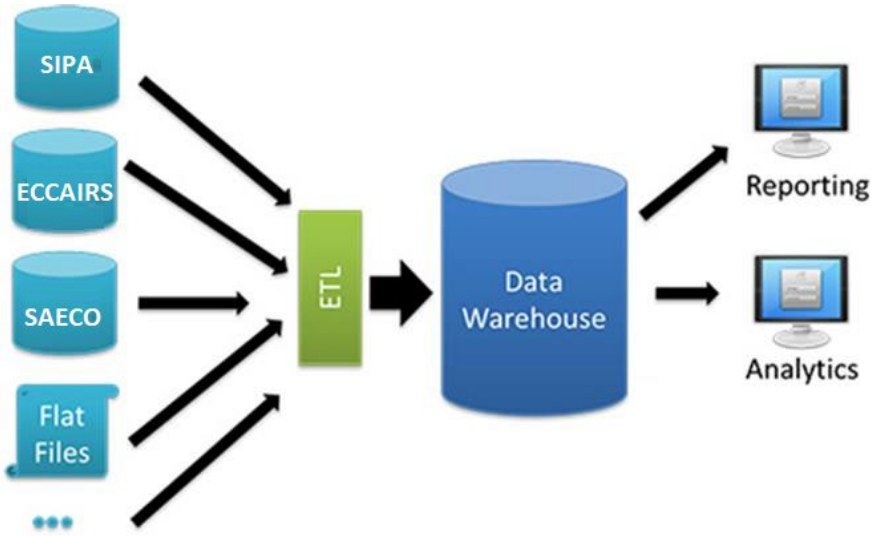
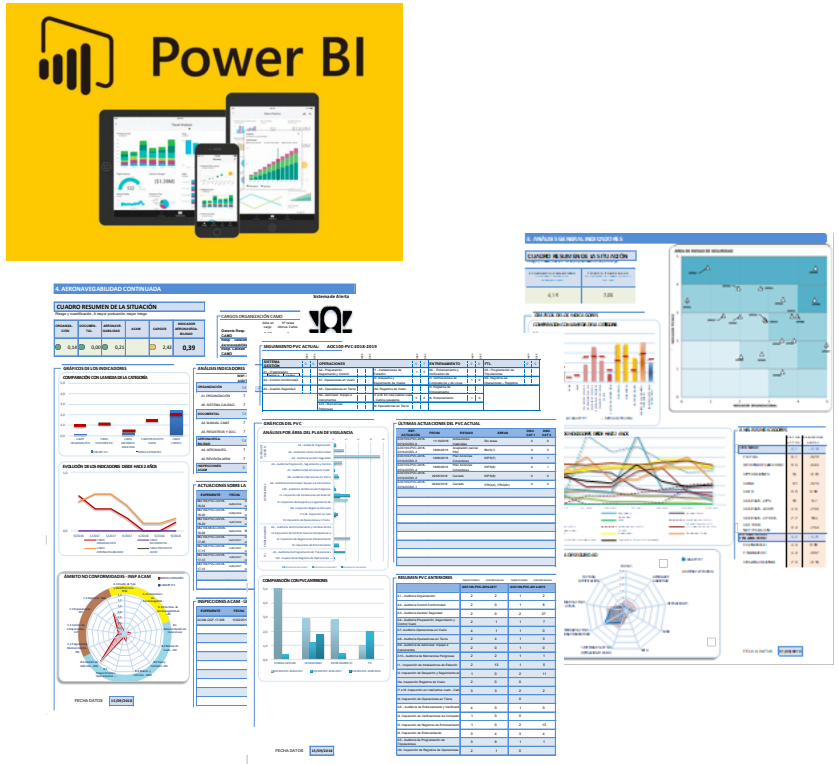
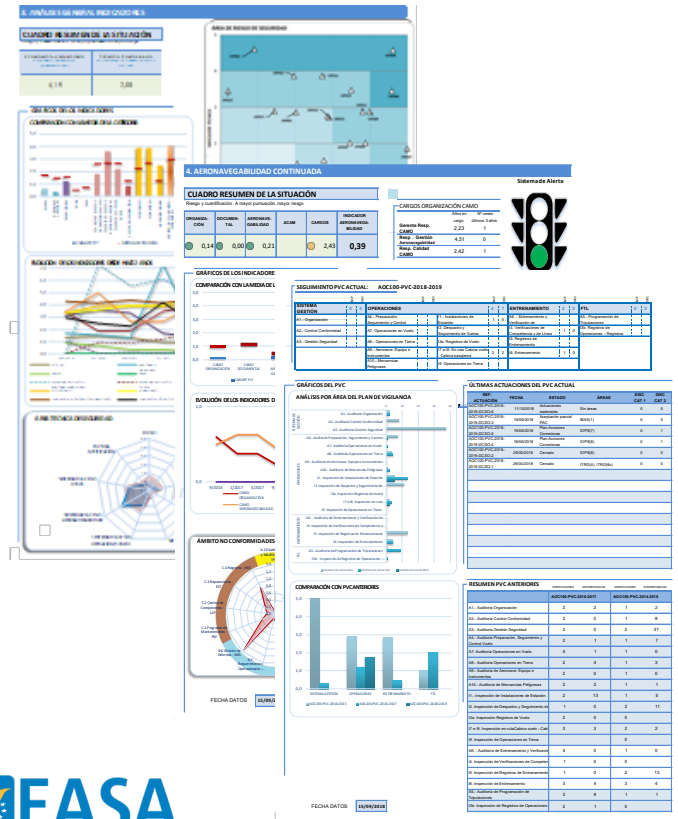
- Data processing systems
  - ✓ Microsoft Excel
  - ✓ ARES – Risk Analysis and Safety Assessment
  - ✓ Microsoft Power BI

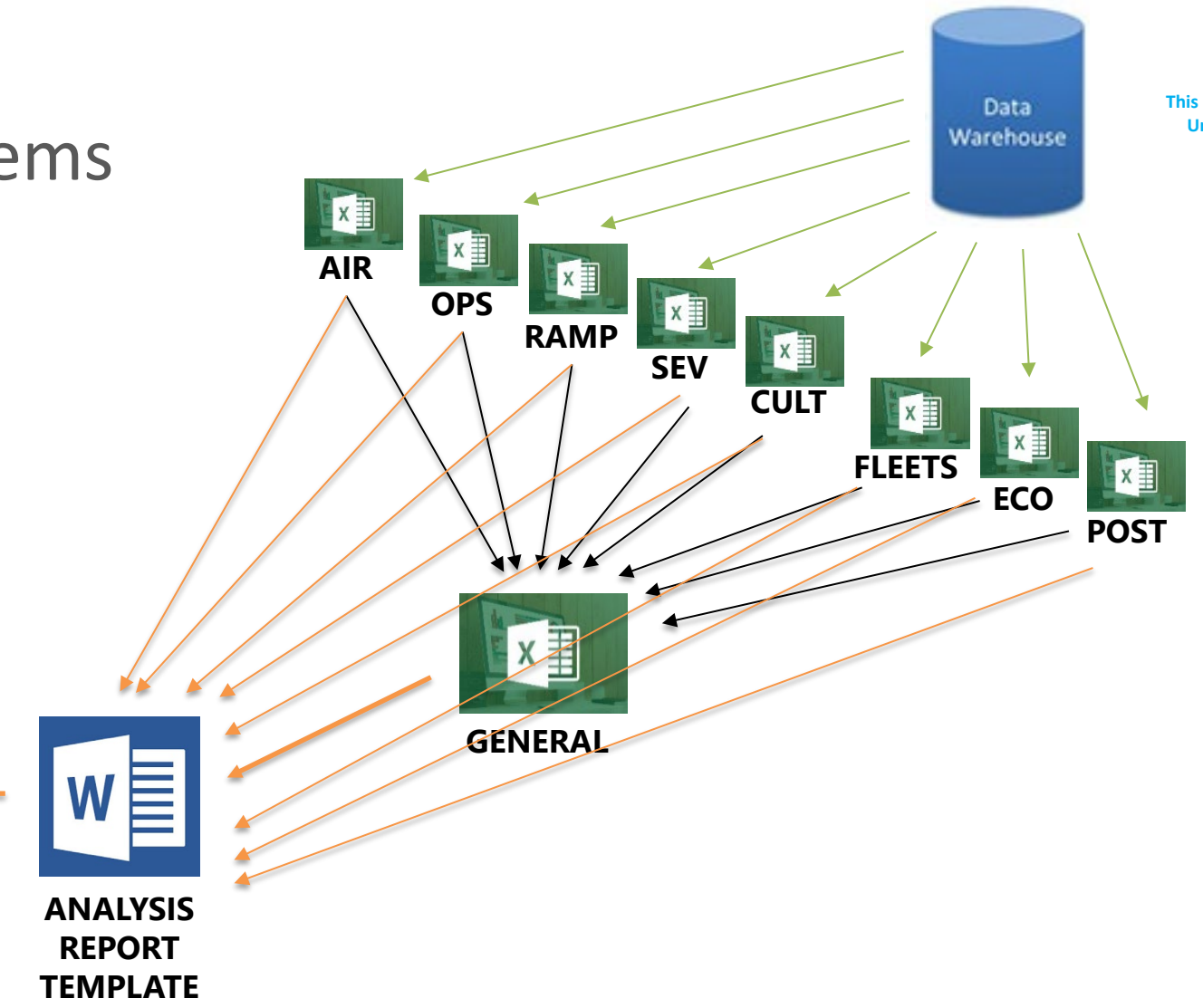




SDCPS tools

- Data processing systems
  - ✓ Microsoft Excel





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SDCPS tools

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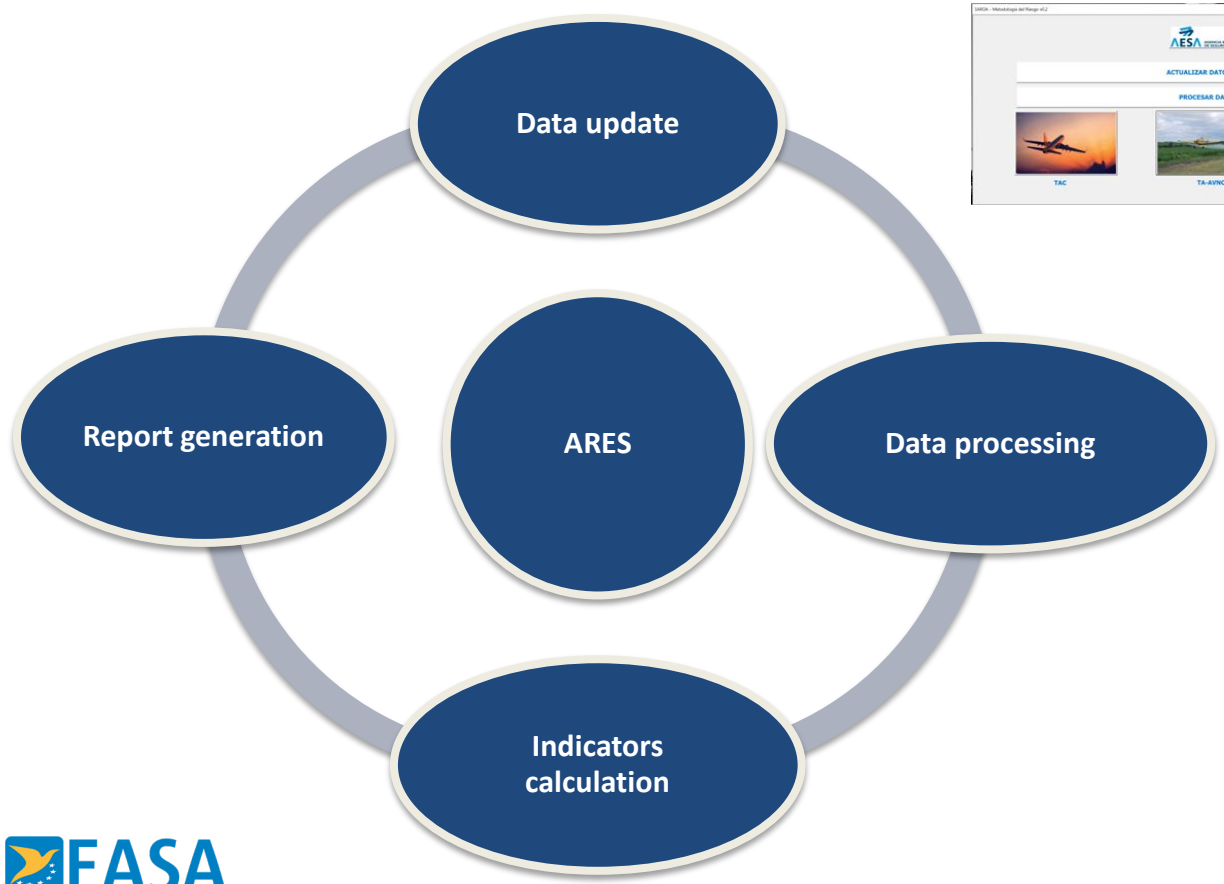
- Data processing systems
  - ✓ ARES – Risk Analysis and Safety Assessment



SDCPS tools

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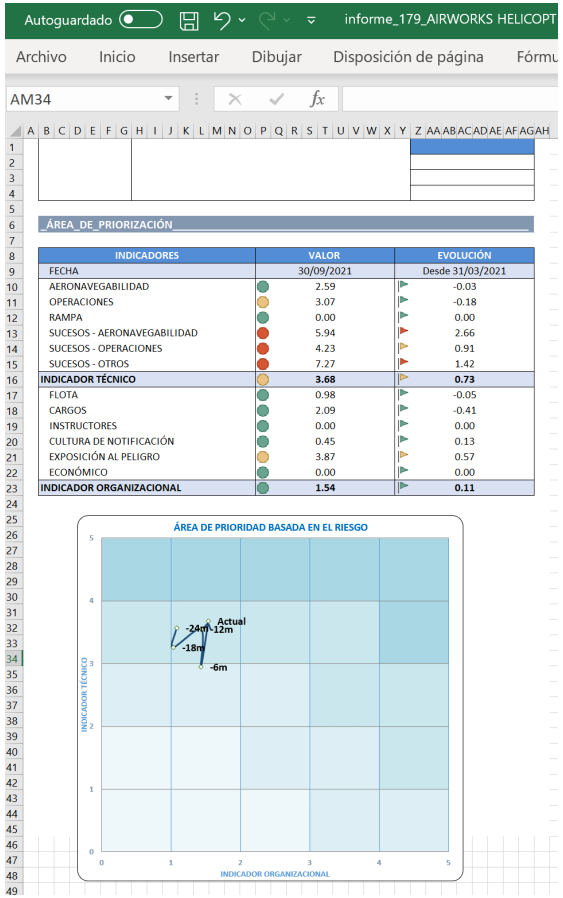
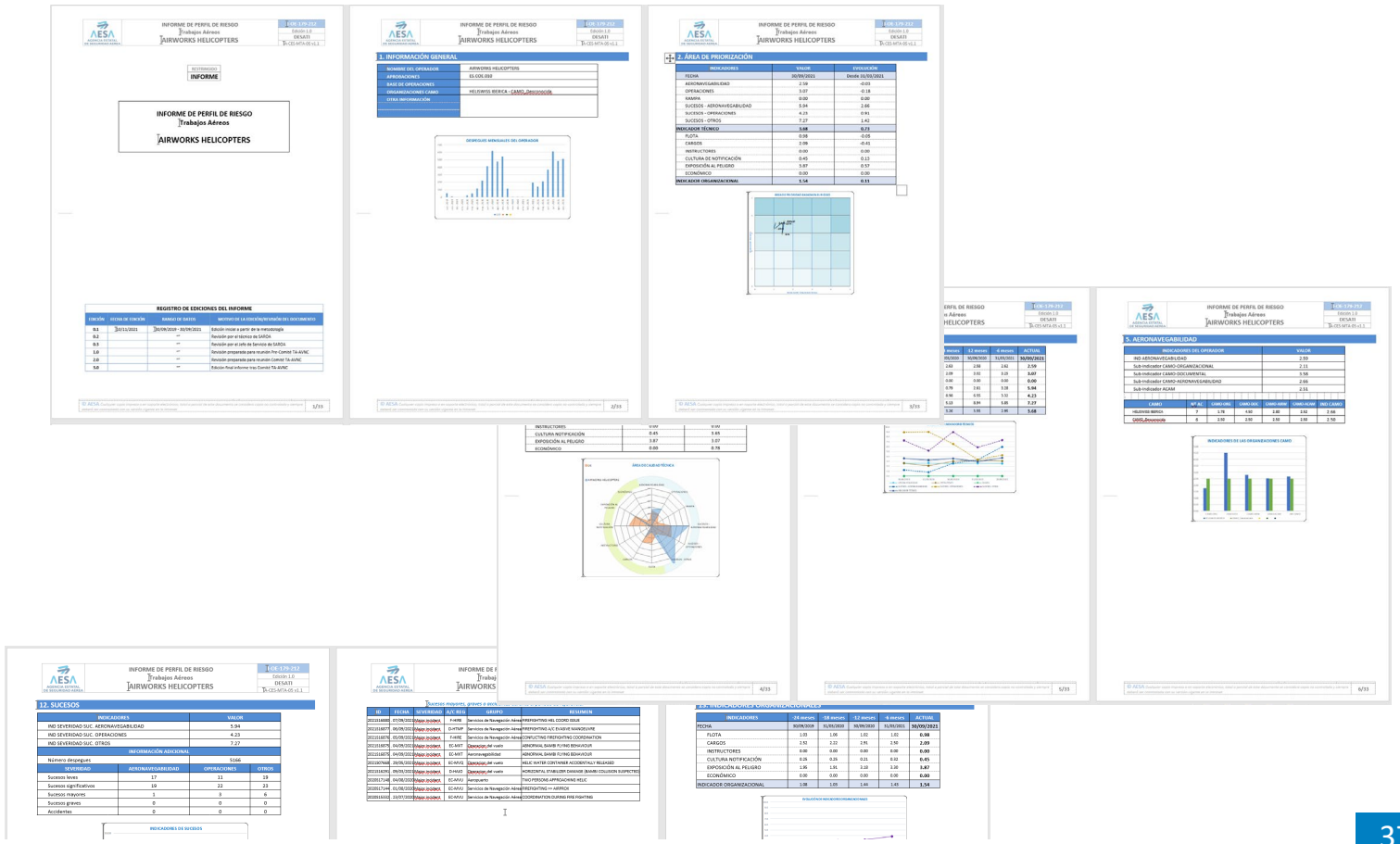
- Data processing systems
  - ✓ ARES – Risk Analysis and Safety Assessment

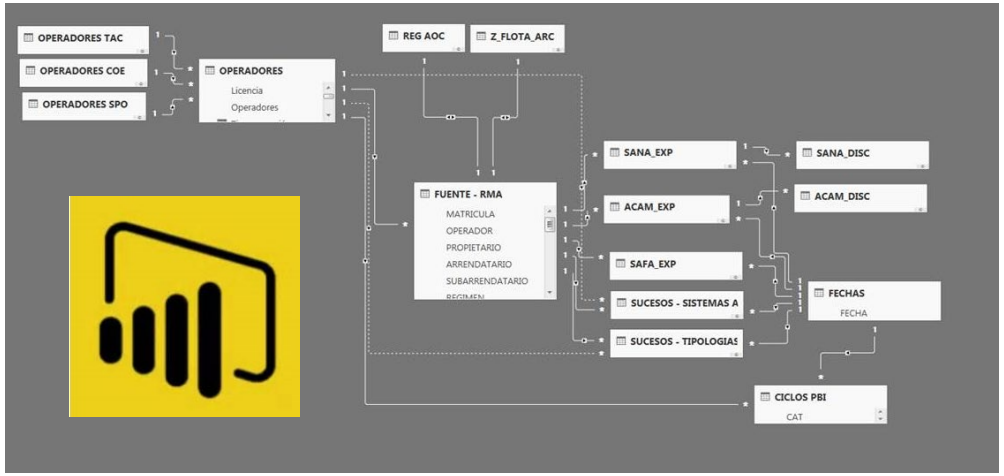


INDICADORES	VALOR	EVOLUCIÓN
FECHA	30/09/2021	Desde 31/03/2021
AERONAVEGABILIDAD	2.59	-0.03
OPERACIONES	3.07	-0.18
RAMPA	0.00	0.00
SUCESOS - AERONAVEGABILIDAD	5.94	2.66
SUCESOS - OPERACIONES	4.23	0.91
SUCESOS - OTROS	7.27	1.42
INDICADOR TÉCNICO	**3.68**	**0.73**
FLOTA	0.98	-0.05
CARGOS	2.09	-0.41
INSTRUCTORES	0.00	0.00
CULTURA DE NOTIFICACIÓN	0.45	0.13
EXPOSICIÓN AL PELIGRO	3.87	0.57
ECONÓMICO	0.00	0.00
INDICADOR ORGANIZACIONAL	**1.54**	**0.11**



SDCPS tools

- Data processing systems
  - ✓ Microsoft Power BI



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ETL

DESIGN

PUBLICATION

Data Acquisition and Transformation with **Power Query**

Creating the data model with **Power Pivot**

Creating reports with **Power View**

Publication with **Power BI Report Server**

Power BI Report Server

- Sharing and Collaboration
- Permissions
- Browsing with Apps

SDCPS tools

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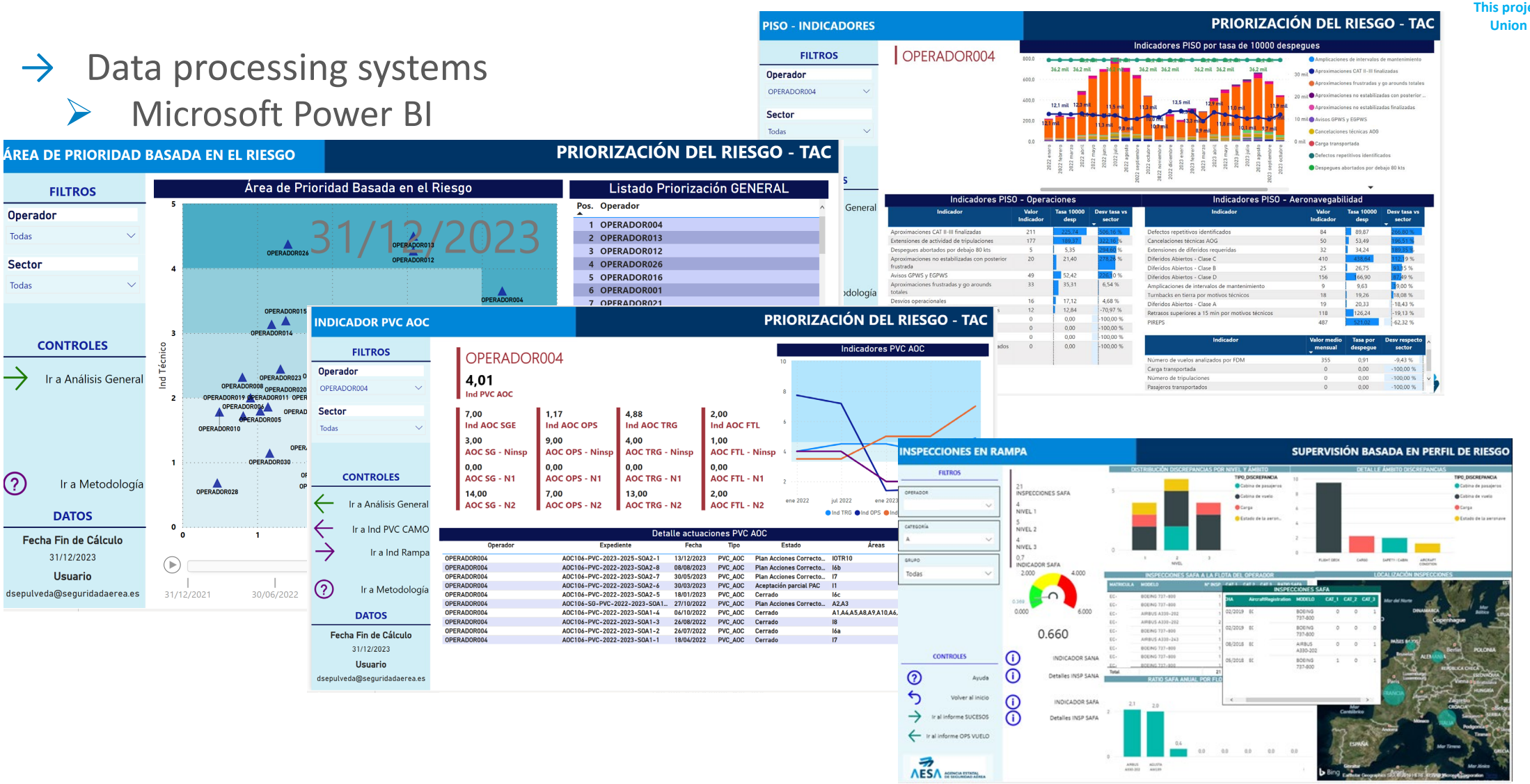
- Data processing systems
  - Microsoft Power BI



Module 10: Data Classification & Initial Safety Assessment

- → Taxonomies, the importance of using harmonised taxonomies
- → Event Coding
- → Review and classification of sample reports
- → Severity assessment

Taxonomies

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What Are Safety Taxonomies and Why Are They Important?

- **Definition:** Taxonomies are structured classification systems used to organise and describe safety data (e.g., type of occurrence, contributing factors, consequences).
- **Purpose:** They enable clear, consistent, and unambiguous understanding of safety information across different organisations and systems.
- **Examples:**
  - ✓ CAST/ICAO Common Taxonomy Team (CICTT) taxonomies (e.g., occurrence categories, phase of flight)
  - ✓ ADREP (Accident/Incident Data Reporting) by ICAO
- Why it matters:
  - ✓ Avoids duplication or misinterpretation of data
  - ✓ Enhances data reliability and quality
  - ✓ Enables meaningful comparison and benchmarking

EASA

Taxonomies

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Benefits of Using Harmonised Taxonomies

- **Interoperability:** Facilitates data exchange between States, operators, and international entities.
- **Trend Analysis:** Harmonised data allows for consistent long-term monitoring and identification of safety trends.
- **Risk Assessment:** Enables integrated and systematic risk analysis across stakeholders.
- **Global Learning:** Supports collective learning from occurrences at regional and global levels (e.g., through ECR).
- **Compliance:** Aligns with ICAO Annex 19 and Doc 9859 requirements.

"Using harmonised taxonomies like ADREP ensures that safety data serves as a reliable foundation for proactive safety management."

Taxonomies

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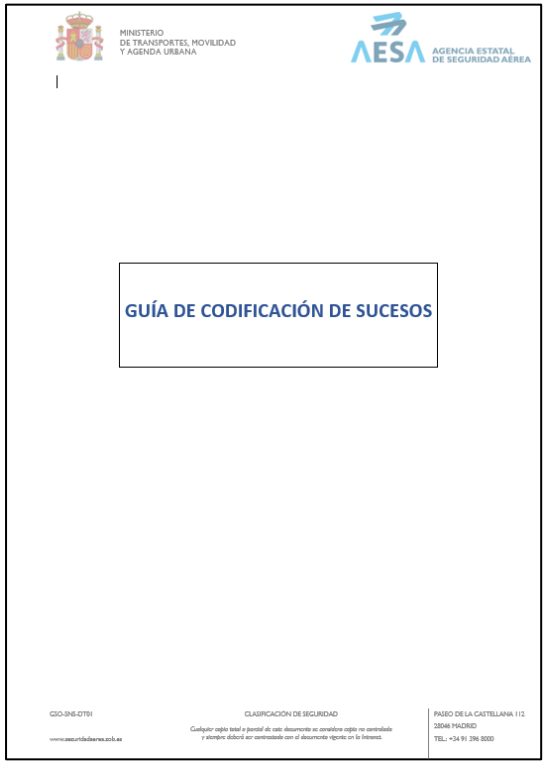
→ Coding Guide


MINISTERIO
DE TRANSPORTES, MOVILIDAD
Y AGENDA URBANA

AESA AGENCIA ESTATAL DE SEGURIDAD AÉREA

GUÍA DE CODIFICACIÓN DE SUCESOS

CLASIFICACIÓN DE SEGURIDAD

PASEO DE LA CASTELLANA 112
28046 MADRID
TEL: +34 91 396 8000

- ✓ National guide to ensure standardization in coding for the occurrences under Spanish responsibility.
- ✓ Definition of the classification of events for the analysis and exploitation of the information.
- ✓ Fully compatible adaptation of the ADREP taxonomy for internal classification.

7 GROUPS → 27 SUBGROUPS/ CATEGORIES → 102 TYPOLOGIES

AERODROME	FLIGHT OPERATIONS	AIR NAVIGATION	AIRWORTHINESS	SECURITY & MEDICINE	EXTERNAL FACTORS	UNCLASSIFIED

Taxonomies

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→ Coding Guide

Once all the initial management and factual data loading steps have been completed, we proceed to the coding of the events.

Event Coding translates the reporters' descriptions into Exploitable Database Language.

This is the basis of our:

- Statistical Analyses
- National Safety Performance Indicators
- Trends Identification

Taxonomies

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→ Coding Guide

GROUP	SUBGROUP	TYPOLOGY
AERODROME	HANDLING	IMPROPER MOVEMENT OR NEAR-COLLISIONS OF VEHICLES/EQUIPMENT
		VEHICLE/EQUIPMENT COLLISION WITH A PARKED AIRCRAFT
		PASSENGER HANDLING AND BOARDING PROCEDURES AND SERVICES
		AIRCRAFT LOADING
		DANGEROUS GOODS
		INCURSION OF VEHICLES OR PEOPLE INTO PLATFORM OR TAXIWAYS
		HANDLING EQUIPMENT (MAINTENANCE AND AVAILABILITY)
	AERODROME INFRASTRUCTURE AND MANAGEMENT	DESIGN, BEACONING, LIGHTING AND OTHER AERODROME SYSTEMS
		AERODROME MAINTENANCE
		PRESENCE OF OBSTACLES/FOD
		AERODROME SERVICES
	GROUND CONFLICTS WITH MOVING AIRCRAFT	GROUND COLLISION POWERED AIRCRAFT
		GROUND COLLISION UNPOWERED AIRCRAFT
		AIRCRAFT GROUND QUASI-COLLISIONS
		JET BLAST
	ANIMAL PRESENCE AND COLLISIONS	PRESENCE OF ANIMAL ON THE TRACK
		PRESENCE OF ANIMALS IN TAXIWAYS, RAMPS AND OTHER AREAS OF THE AIRPORT
		COLLISION OR NEAR COLLISION WITH ANIMALS

Taxonomies

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→ Coding Guide

GROUP	SUBGROUP	TYPOLOGY
FLIGHT OPERATION	SPECIAL AIRCRAFT	AEROSTAT SPECIFICS
		GLIDER & SAILBOAT SPECIFICS
		RPAS SPECIFIC
	FLIGHT AND AIRCRAFT MANAGEMENT	FLIGHT PREPARATION
		AIRCRAFT HANDLING / SOPs / FLIGHT MANAGEMENT
		FUEL MANAGEMENT
		FAILURE TO COMPLY WITH OPERATIONAL APPROVALS
		CREW/ACTIVITY MANAGEMENT
		WARNING SYSTEMS (OTHER)
		EVACUATION
		DESTABILIZED APPROACH
		PASSENGER CABIN PROCEDURES AND EQUIPMENT
	ABNORMAL CONTACT ON RUNWAY	HARD, HEAVY, FAST, LONG, OFF-CENTER, OR MISALIGNED GROUNDING
		TAIL/WING STRIKE
		LANDING WITH RETRACTED GEAR OR WITHOUT FLAPS
	AIRCRAFT DEPARTURE FROM MOVEMENT AREAS	DEPARTURE FROM RUNWAY
		OTHER AIRFIELD SURFACE DEPARTURES
		LANDING PAST THE RUNWAY (OVERSHOOT)
		LANDING BEFORE THE RUNWAY (UNDERSHOOT)

Taxonomies

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→ Coding Guide

GROUP	SUBGROUP	TYPOLOGY
FLIGHT OPERATION	COLLISIONS/NEAR-COLLISIONS WITH TERRAIN/OBSTACLES	CFIT
		EGPWS/TAWS WARNINGS
		COLLISION WITH OBJECTS DURING TAKE-OFF/LANDING
	SPECIFIC AERIAL WORK	LOW-ALTITUDE OPERATIONS
		EXTERNAL LOAD OPERATIONS
	LOSS OF CONTROL AND ABRUPT MANOEUVRES	LOSS OF GROUND CONTROL
		LOSS OF CONTROL IN FLIGHT
		ABRUPT MANOEUVRE

Taxonomies

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→ Coding Guide

GROUP	SUBGROUP	TYPOLOGY
AIR NAVIGATION SERVICES	SEPARATION LOSSES AND ANTI-COLLISION ALERTS	IN-FLIGHT COLLISIONS BETWEEN AIRCRAFT
		TCAS ALERTS
		MINIMUM SEPARATION LOSSES
		IMPROPER SEPARATION
		COLLISION AVOIDANCE ALERTS (ATC)
	INCURSIONS INTO MOVEMENT AREAS	INCURSION INTO AIRCRAFT RUNWAY
		INCURSION INTO THE TRACK OF VEHICLES OR PEOPLE
		AIRCRAFT RAMP/TAXIWAY INCURSION

Taxonomies

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→ Coding Guide

GROUP	SUBGROUP	TYPOLOGY
AIR NAVIGATION SERVICES	ATM/AIS SERVICES	DEVIATION OF ATS AUTHORIZATIONS (PILOT)
		CREW COMMUNICATIONS - ATC
		DEVIATION FROM PUBLISHED ATM CHARTS AND PROCEDURES (PILOT)
		AIRSPACE VIOLATION
		ATS SERVICE DIVERSION (ATS PERSONNEL)
		ATS – ATS COORDINATION FAILURE
		ATS/ACTIVITY PERSONNEL MANAGEMENT
		AIRSPACE PLANNING, DESIGN AND CAPACITY
		AERONAUTICAL INFORMATION SERVICE (AIS)
		METEOROLOGICAL SERVICE (MET)
		EMERGENCY ATM EVENTS / SECURITY
	AIR NAVIGATION SYSTEMS	CNS RULING – COMMUNICATIONS
		CNS FAILURE - SURVEILLANCE AND DATA PROCESSING
		CNS RULING – NAVIGATION
		CNS RULING – OTHER

Taxonomies

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→ Coding Guide

GROUP	SUBGROUP	TYPOLOGY
AIRWORTHINESS	FUEL	LACK OF FUEL
		CONTAMINATION/WRONG FUEL TYPE
	FIRE/SMOKE	FIRE/POST-IMPACT SMOKE
		FIRE/SMOKE WITHOUT IMPACT
	EFFECT OF TECHNICAL CONDITIONS ON THE AIRCRAFT	DECOMPRESSIONS
		ODORS
		VIBRATIONS
		INTERFERENCE BY ELECTRONIC EQUIPMENT (PED)
	AIRCRAFT SYSTEMS	NON-MOTOR SYSTEM FAILURES
		MOTOR SYSTEM FAILURES
		UNIDENTIFIED TECHNICAL FAULTS
	DESIGN, MAINTENANCE & REGULATIONS	DESIGN & MANUFACTURING
		MAINTENANCE
		REGULATORY NON-COMPLIANCE WITH AIRWORTHINESS

Taxonomies

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→ Coding Guide

GROUP	SUBGROUP	TYPOLOGY
SECURITY AND MEDICINE	SECURITY	CONFLICTING PASSENGER
		BOMB THREAT
		HIJACKING OF THE AIRCRAFT
		OTHER/GENERAL SECURITY
	MEDICINE	MEDICAL EMERGENCY (PASSENGERS)
		TECHNICAL CREW INCAPACITATION

GRUPO	SUBGROUP	TYPOLOGY
EXTERNAL FACTORS	METEOROLOGICAL PHENOMENA	STORM
		SHEAR
		WEATHER TURBULENCE
		WINDS
		WAKE TURBULENCE
		ICING
		OTHER WEATHER CONDITIONS
		UIMC
	BIRD STRIKES	BIRD COLLISION
		BIRD INGESTION
		NEAR COLLISION WITH BIRDS
	EXTERNAL CONDITIONS	EXTERNAL EFFECTS ON THE AIRCRAFT/CONTROL TOWER

Taxonomies

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→ Coding Guide

GROUP	SUBGROUP	TYPOLOGY
UNCLASSIFIED EVENTS	OTHER EVENTS	OTHER EVENTS
	UNDETERMINED	UNDETERMINED

Event Coding

This project is funded by the European Union and implemented by EASA

Golden Rules– Main Princip

1. Read the definitions
2. Do not invent
3. Be specific
4. Enter causal factors, not
5. Align Events and Occurr
6. Aling Events and Descrip
7. Complete the Sequence
8. Events must be in time s
9. Provide precursors for c events

e background data

ur spelling

e History of flight and Flight

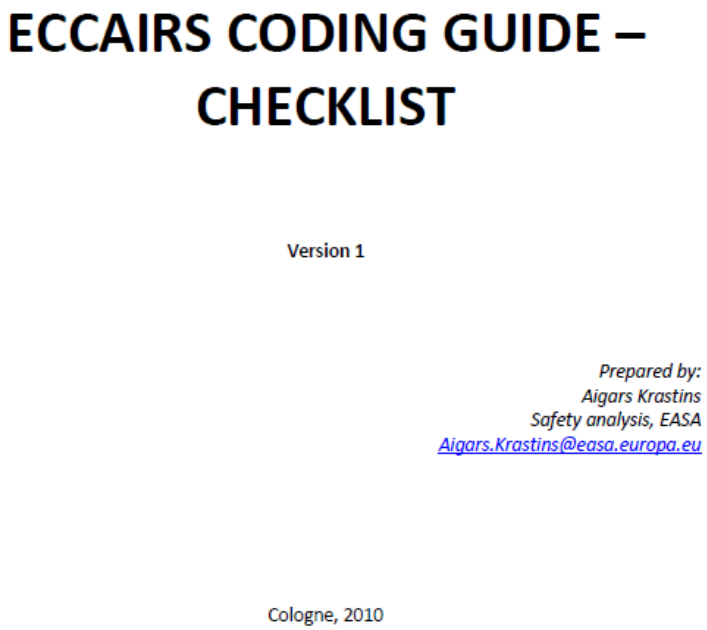
overall classification and zation

events respectively

rs sequencing

e failures from false indications

eld units


ECCAIRS CODING GUIDE – CHECKLIST

Version 1

Prepared by:
Aigars Krastins
Safety analysis, EASA
Aigars.Krastins@easa.europa.eu

Cologne, 2010

Event Coding

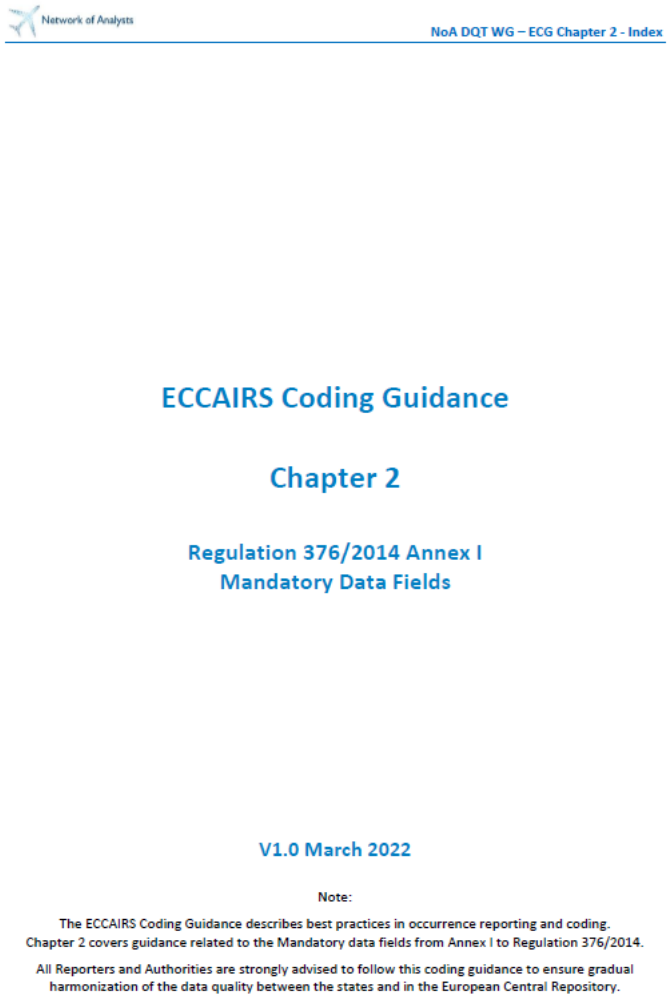
This project is funded by the European Union and implemented by EASA

Correct use of the database:

There is a minimum quality standard that is expected from all authorities. That's why the **Network of analysts** produced a common coding guidance.

This document relates the mandatory data fields and their implementation in ECCAIRS from the point of view of the user as attributes of the report.

https://aviationreporting.eu/sites/default/files/2022-07/ECG%20Chapter%202_v1.0.pdf



Event Coding

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Correct use of the database:

Attribute name	**EVENT TYPE**	ECCAIRS ID	**390**
R376/2014 name	(7) Events; — Event Type	Parent Entity	24

		Change [Yes/No]
Description	Event type	NO
Detailed description	Event types for the occurrence	**YES**
Explanation	Predefined list of event types to describe an occurrence.	**YES**

ECCAIRS Coding Guidance

Events and Occurrence Category (ID 430) shall correlate to each other and therefore the Occurrence Categories that are selected shall be supported by appropriate event types.

Code all relevant events for the occurrence, not only top (or "any") event. It is good practice to code the events in chronological order, which ensures better readability and completeness of *chain of events*.

Make sure you select events under the correct level (parent) above (callsign confusion event can be selected from crew or from ATM perspective).

Event Coding

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→ Coding Guide

TIPO	CATEGORÍA	EVENTO	F. DESCRIPTIVO	MODIFICADOR
presence of an animal on runway b/a *AB*	WILD (27) **A**	• Presence of Wildlife/Birds on Runway (99010128:Value) **B**	(OPCIONAL) • Aircraft components and systems (11000000: Level2) • Runway as an entity (41100000: Level3)	(OPCIONAL) • Animal in/on (180)

Occurrences related to the presence of an animal or bird on the runway or in the runway restricted area. In these cases, it is necessary to specify that the animal or bird is 'on runway' by filling in the Aerodrome ECCAIRS field 'Location on (641)'.

Quality query based on Karnaugh Maps

Coding: Category + Events + Descriptive Factors + Modifiers

Calling Query

Description

Event Coding

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Correct use of the database:

Example:

There is an occurrence where one aircraft has to perform a go around because of another aircraft made a runway incursion due to a taxi error originating from callsign confusion. All these 4 events (at least 4) should be coded in chronological order as event types in the occurrence.

Call sign confusion → Taxi Clearance Deviation → Runway incursion → Go-around

In order to represent a complete picture of an occurrence it is recommended to select, when possible, for each selected Event Type (ID 390) and Event Phase (ID 391) and [link every event with applicable entity (aircraft, aerodrome, ANS Unit etc.)][1]

Event Coding

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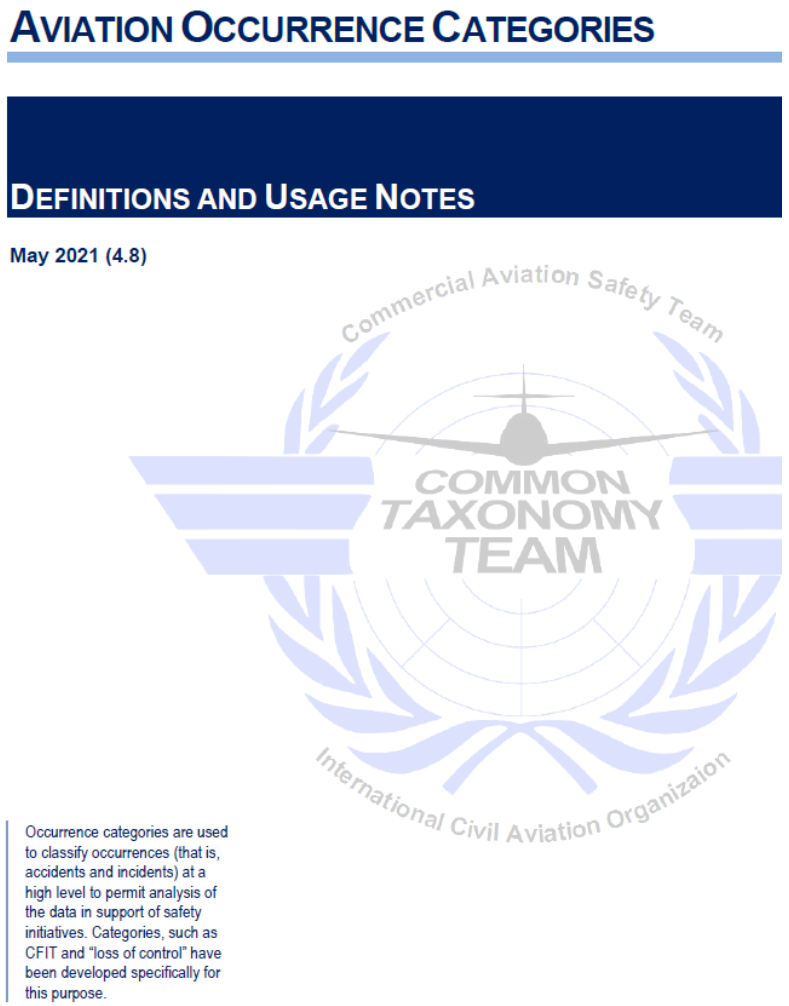
Correct use of the database:

As stated, the events must be in accordance with the Occurrence Categories as originally defined in the ADREP Taxonomy.



Event Coding

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Correct use of the database:

CONTROLLED FLIGHT INTO OR TOWARD TERRAIN (*CFIT*)

In-flight collision or near collision with terrain, water, or obstacle without indication of loss of control.

Usage Notes:

- Use only for occurrences during airborne phases of flight.
- Includes collisions with those objects extending above the surface (for example, towers, trees, power lines, cable car support, transport wires, power cables, telephone lines and aerial masts).
- Can occur during either Instrument Meteorological Conditions (IMC) or Visual Meteorological Conditions (VMC).
- Includes instances when the cockpit crew is affected by visual illusions or degraded visual environment (e.g., black hole approaches and helicopter operations in brownout or whiteout conditions) that result in the aircraft being flown under control into terrain, water, or obstacles.
- If control of the aircraft is lost (induced by crew, weather or equipment failure), do not use this category, use Loss of Control–Inflight (*LOC–I*) instead.
- For an occurrence involving intentional low altitude operations (e.g., crop dusting, aerial work operations close to obstacles, and Search and Rescue (SAR) operations close to water or ground surface) use the Low Altitude Operations (*LALT*) code instead of *CFIT*.
- Do not use this category for occurrences involving intentional flight into/toward terrain in manned aircraft or intentional ground impact of unmanned aircraft. Code all collisions with obstacles during takeoff and landing under Collision With Obstacle(s) During Takeoff and Landing *(CTOL)*. Code all suicides under Security Related (*SEC*) events. Code system, equipment, or command and control failures involving unmanned aircraft under System/Component Failure or Malfunction (Non-Powerplant) (*SCF–NP*) or *LOC–I* as applicable.
- Do not use this category for occurrences involving runway undershoot/overshoot, which are classified as Undershoot/Overshoot (*USOS*).
- Includes flying into terrain during transition into forward flight.
- For helicopter operations, not to be used for takeoff and landing phases, except when the occurrence involves flying into terrain without indication of loss of control during transition into forward flight.

FUEL RELATED (*FUEL*)

One or more powerplants experienced reduced or no power output due to fuel exhaustion, fuel starvation/mismanagement, fuel contamination/wrong fuel, or carburetor and/or induction icing.

Usage Notes:

- The following fuel-related definitions are provided for clarity:
  - Exhaustion: No usable fuel remains on the aircraft.
  - Starvation/mismanagement: Usable fuel remains on the aircraft, but it is not available to the engines.
  - Contamination: Any foreign substance (for example, water, oil, ice, dirt, sand, bugs) in the correct type of fuel for the given powerplant(s).
  - Wrong fuel: Fuel supplied to the powerplant(s) is incorrect, for example, Jet A into a piston powerplant, 80 octane into a powerplant requiring 100 octane.
- Includes flight crew or ground crew-induced fuel-related problems that are not the result of mechanical failures. Interruptions of the fuel supply caused by mechanical failures are coded elsewhere as non-powerplant or powerplant system/component failures (System/Component Failure or Malfunction (Powerplant) (*SCF–PP*) or System/Component Failure or Malfunction (Non-Powerplant) (*SCF–NP*)), as appropriate.
- Also used when the wrong fuel causes a powerplant failure (e.g., through detonation). In this case it should be coded as *FUEL*, not as a system/component failure or malfunction–powerplant (System/Component Failure or Malfunction (Powerplant) (*SCF–PP*).
- Includes cases in which there was a high risk of fuel exhaustion but there was no actual loss of power.
- Includes exhaustion of battery(s) used as an energy source for the powerplant(s) (e.g., electrically propelled aircraft), including unmanned aircraft.

GLIDER TOWING RELATED EVENTS (*GTOW*)

Premature release, inadvertent release or non-release during towing, entangling with towing, cable, loss of control, or impact into towing aircraft/winch.

Usage Notes:

- Applicable both to aircraft under tow by winch or by another aircraft, or to aircraft executing towing.
- To be used in events only after reaching airborne phase.
- Includes loss of control because of entering the towing aircraft wake turbulence and events in which airspeed is out of limits during tow.

Event Coding

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Correct use of the database:

SAMPLE OPERATIONAL GROUPING OF CATEGORIES

Airborne	
ABRUPT MANEUVER	*AMAN*
AIRPROX/TCAS ALERT/LOSS OF SEPARATION/NEAR MIDAIR COLLISIONS/MIDAIR COLLISIONS	*MAC*
CONTROLLED FLIGHT INTO/TOWARD TERRAIN	*CFIT*
FUEL RELATED	*FUEL*
GLIDER TOWING RELATED EVENTS	*GTOW*
LOSS OF CONTROL–INFLIGHT	*LOC–I*
LOSS OF LIFTING CONDITIONS EN ROUTE	*LOLI*
LOW ALTITUDE OPERATIONS	*LALT*
NAVIGATION ERRORS	*NAV*
UNINTENDED FLIGHT IN IMC	*UIMC*
Aircraft	
FIRE/SMOKE (NON-IMPACT)	*F–NI*
SYSTEM/COMPONENT FAILURE OR MALFUNCTION (NON-POWERPLANT)	*SCF–NP*
SYSTEM/COMPONENT FAILURE OR MALFUNCTION (POWERPLANT)	*SCF–PP*
Ground Operations	
EVACUATION	*EVAC*
FIRE/SMOKE (POST-IMPACT)	*F–POST*
GROUND COLLISION	*GCOL*
GROUND HANDLING	*RAMP*
LOSS OF CONTROL–GROUND	*LOC–G*
NAVIGATION ERRORS	*NAV*
RUNWAY EXCURSION	*RE*
RUNWAY INCURSION	*RI*
WILDLIFE	*WILD*
Miscellaneous	
BIRD	*BIRD*
CABIN SAFETY EVENTS	*CABIN*
EXTERNAL LOAD RELATED OCCURRENCES	*EXTL*
MEDICAL	*MED*
OTHER	*OTHR*
SECURITY RELATED	*SEC*
UNKNOWN OR UNDETERMINED	*UNK*
Non-aircraft-related	
AERODROME	*ADRM*
ATM/CNS	*ATM*
Takeoff and Landing	
ABNORMAL RUNWAY CONTACT	*ARC*
COLLISION WITH OBSTACLE(S) DURING TAKEOFF AND LANDING	*CTOL*
UNDERSHOOT/OVERSHOOT	*USOS*
Weather	
ICING	*ICE*
TURBULENCE ENCOUNTER	*TURB*
WIND SHEAR OR THUNDERSTORM	*WSTRW*

Event Coding

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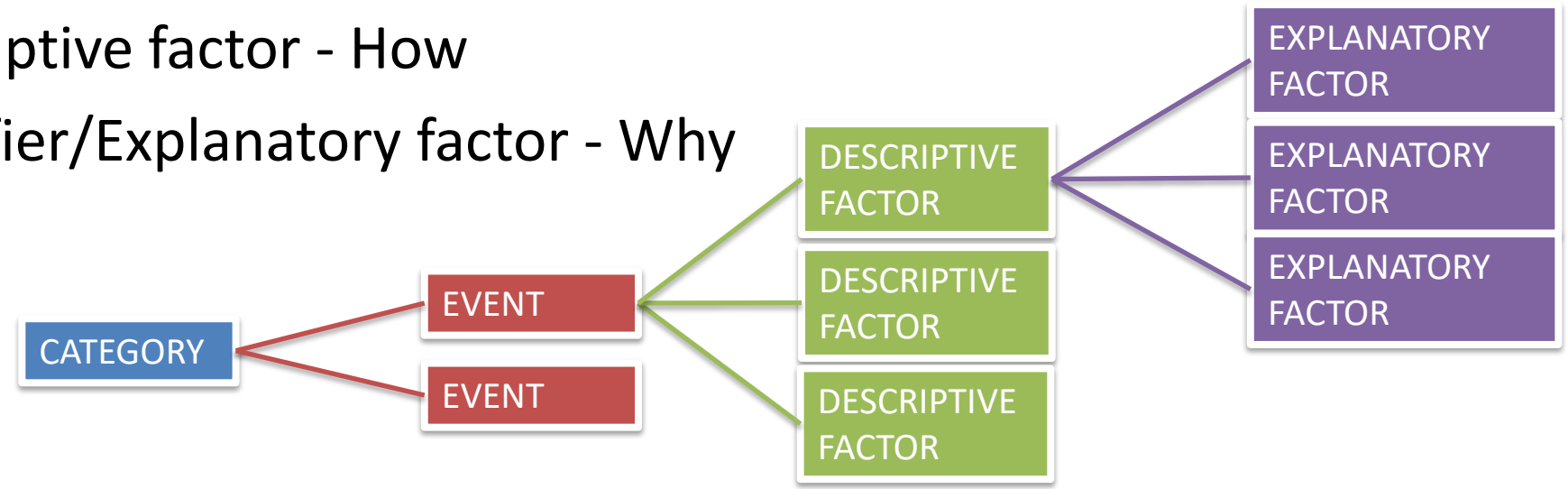
Multi-layered events codification:

- Occurrence category - What
- Event type / Flight phase – What and When
- Descriptive factor - How
- Modifier/Explanatory factor - Why



WHAT
Statistics
Indicators
Etc

WHAT
Safety Analysis
Precursors

HOW
Safety Analysis
Technical Factors

WHY
Safety Analysis
Human Factors

Review of sample reports

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→ Events coding example

OCCURRENCE NARRATIVE

Ten minutes after reaching TOC crew noticed arcing and smoke traces from F/O windshield, then inner pane cracked. Crew reacted immediately and tripped relevant C/B, then began an emergency descend. Crew informed ATC after they were challenged for FL deviation. No AIRPROX occurred. Once at FL150 crew decided to divert to alternate airport. Landing was performed uneventfully.

Maintenance personnel confirmed wire grounded in window heater. Wiring was repaired and windshield replaced. Aircraft returned to service.

EVENTS

- WINDOW HEATER WIRING GROUNDED – ARCING/SMOKE
- WINDSHIELD INNER PANE CRACKED
- EMERGENCY DESCEND
- LATE CREW-ATC COMMS
- DIVERSION TO ALTERNATE AERODROME

Review of sample reports

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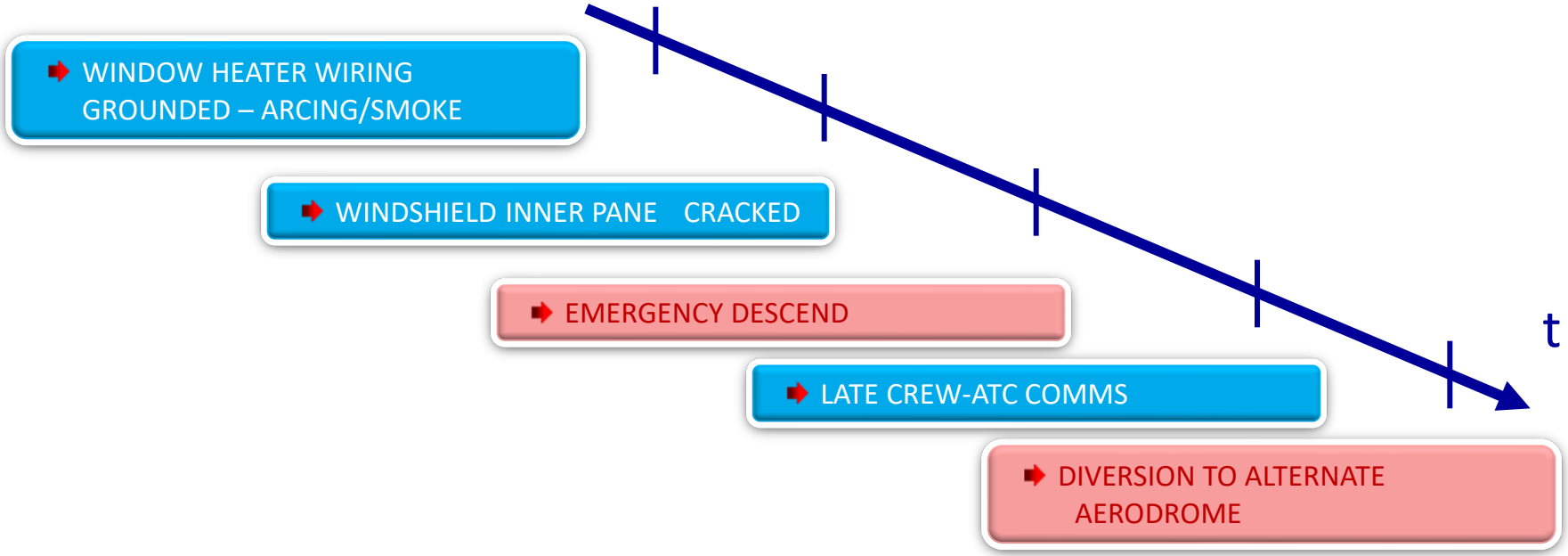

- Smoke - Cockpit , during Cruise. (Aircraft - EC-ZZZ)
  - Windshield/door rain/ice removal (ATA Code:3040) : Electrical failure; Arced/arcing; Smoke/fumes
- 5610 Flight compartment window , during Cruise. (Aircraft - EC-ZZZ)
  - Flight compartment windows/windshields (ATA Code:5610) : Cracked
- Emergency descent , during Cruise. (Aircraft - EC-ZZZ)
- Communications between pilot and air navigation service related event , during Emergency descent en-route. (Aircraft - EC-ZZZ)
  - Flight crew's communication : Late
    - *Flight crew., Task allocation*
- Diversion due to technical reasons , during Emergency descent en-route. (Aircraft - EC-ZZZ)

Review of sample reports

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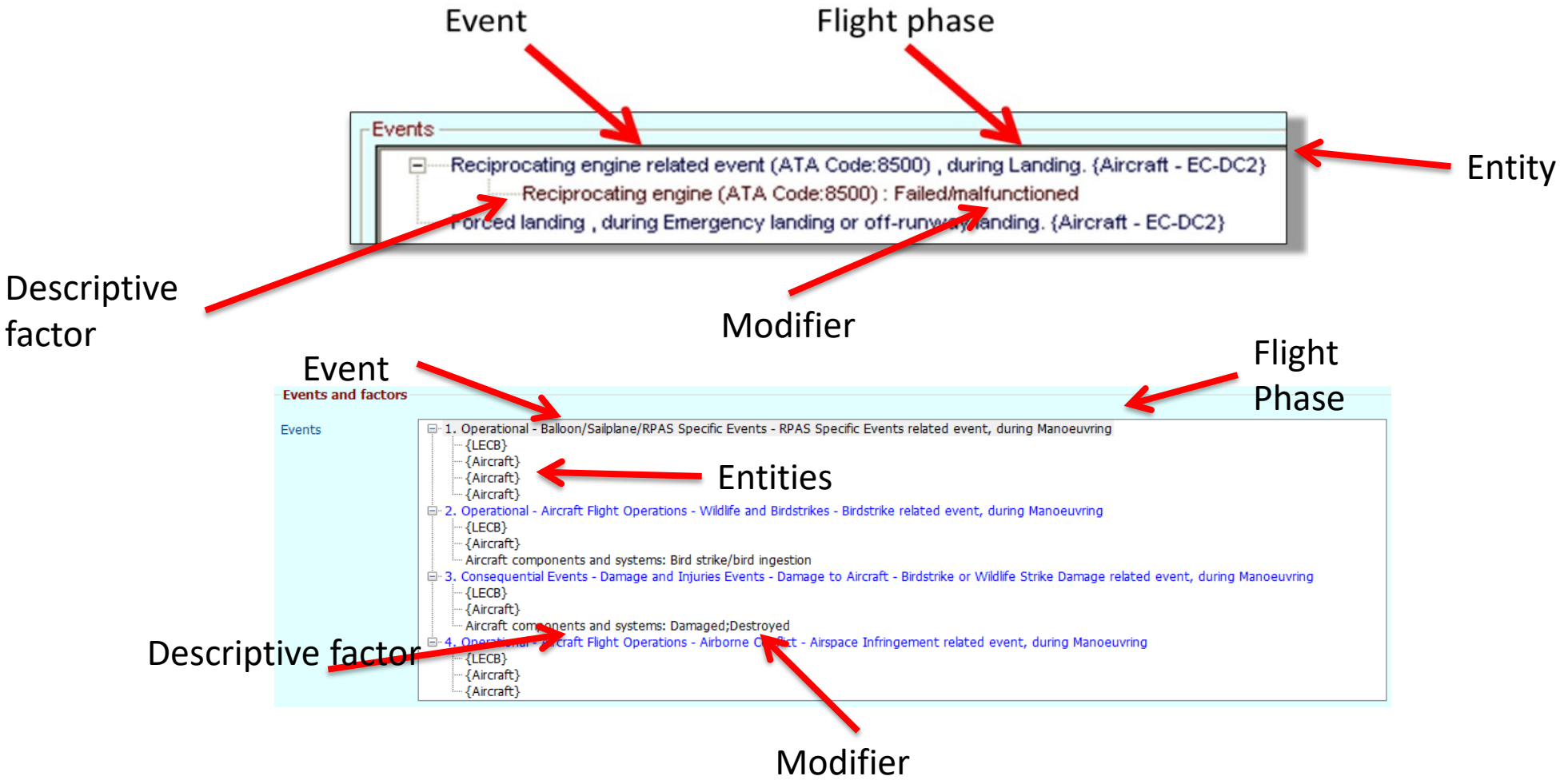
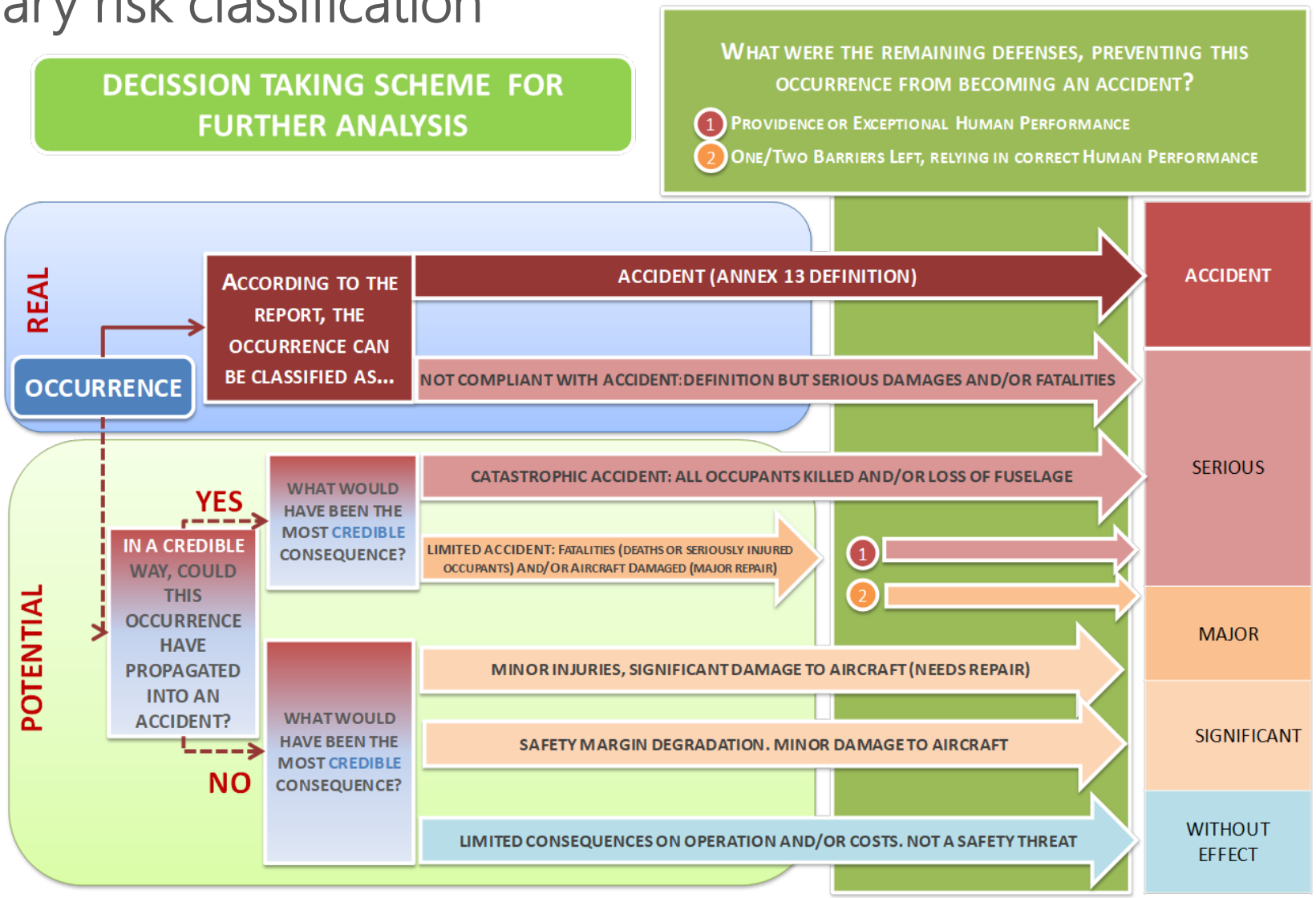
→ End of the coding step: Add phases and link entities



Severity assessment

→ Preliminary risk classification



CREDIBLE: REALISTIC OR REASONABLE. IT MAY OCCURR ONCE FOR THIS COMBINATION OF CIRCUMSTANCES

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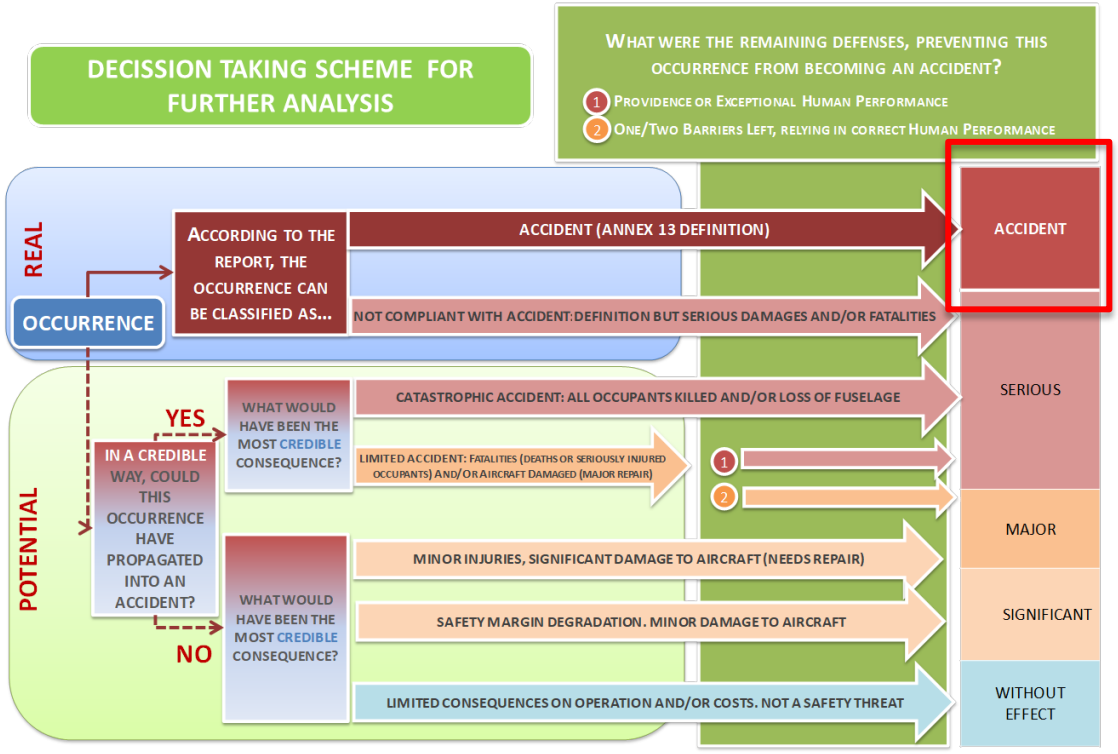
Severity assessment

→ Preliminary risk classification

Pilot explains that he does the landing with flaps full before the 1st 1/3rd of the runway, he feels a vibration on the gears, therefore decides to go on idle and hold the nose wheel up to adjust the wheels, afterwards, he puts full throttle, and notices that he still has the flaps on full position, which makes him doubt if to retard the throttle and put flaps on take off to later put full power again. Meanwhile, he realises that he has no runway left, which then he decides to abort the take off and applies full brakes without removing the power. It is at this moment that the aircraft veers outside of the runway. He secures the aircraft once the firefighters are at the scene.



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Severity assessment

→ Preliminary risk classification

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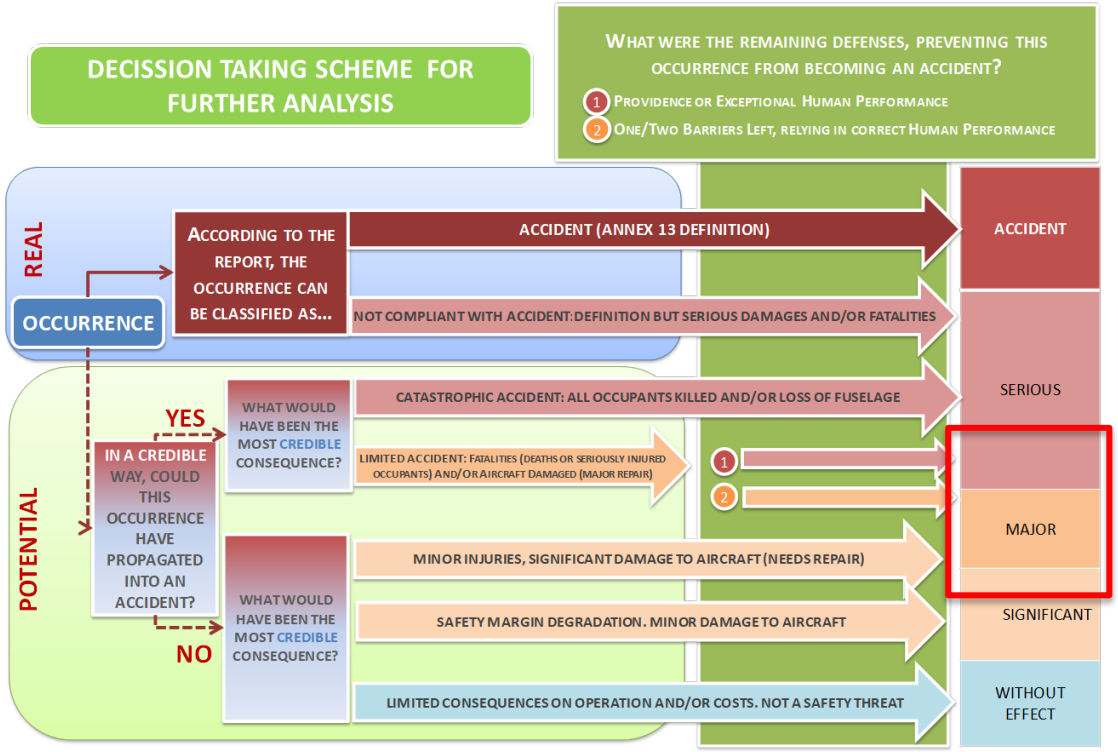
When loading the aircraft and when flight crew were arriving, they saw that the nose wheel was rising, the mechanic ran out when he saw it and stopped them; the scissors of the NLG has become fully extended, there was a huge risk of pitch up. The handling was loading the aircraft with a loadsheet & LIR out of limits.



Severity assessment

→ Preliminary risk classification

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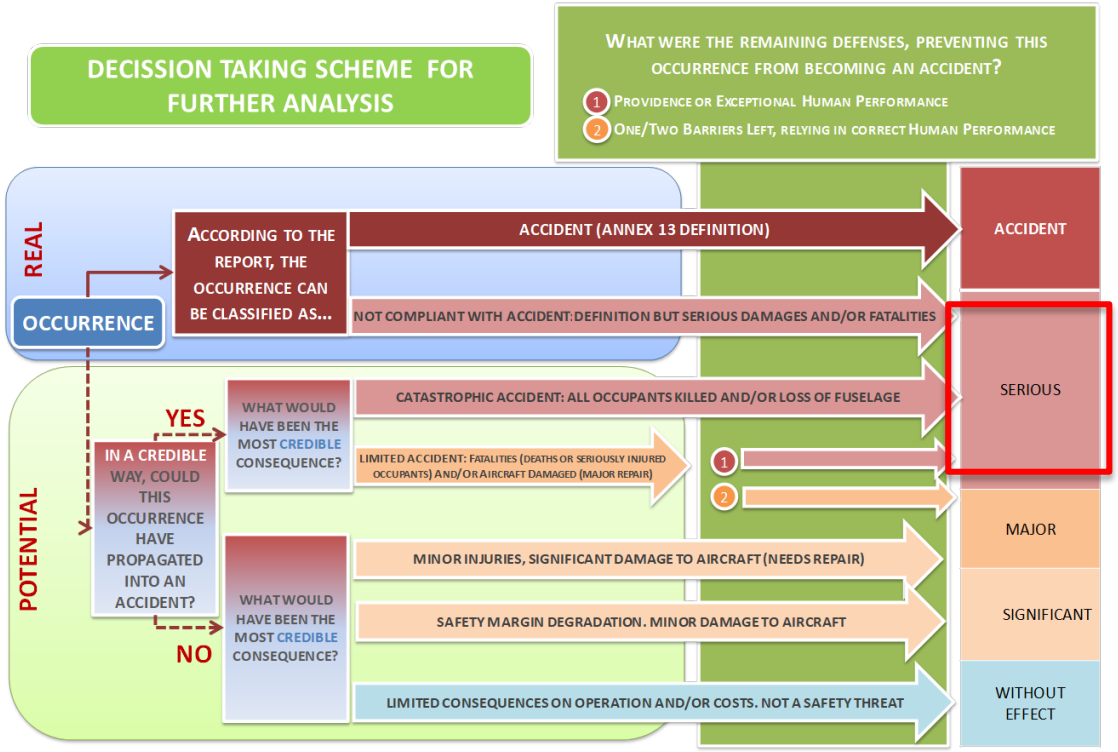
Near collision between A/C1 and A/C2.

While performing basic instrument maneuvers over the sea, we identified another A/C2 aircraft on the opposite course slightly to our right, about 100 meters away and at almost the same altitude. We made a left turn while descending, while the other aircraft maintained heading and altitude. After a few minutes, we met the same aircraft again, traveling in the opposite direction, this time a little farther away, but we changed course again. Reviewing the private radar live information, I saw that the other aircraft was A/C2.



Module 11: Safety Risk Classification of Occurrences (SSP & SMS)

- European Risk Classification Scheme (ERCS) and related regulations
- Practical examples and case studies
- Other safety risk classification methodologies: SSP & SMS
- Interface Risks

European Risk Classification Scheme

This project is funded by the European Union and implemented by EASA

COMMISSION DELEGATED REGULATION (EU) 2020/2034

of 6 October 2020

supplementing Regulation (EU) No 376/2014 of the European Parliament and of the Council as regards the common European risk classification scheme

It establishes what is intended to be done, to unify all risk classification schemes into a common one of mandatory use by the authorities.

Defines the system's base of Key Risk Areas, Barriers and Weights.

European Risk Classification Scheme

This project is funded by the European Union and implemented by EASA

→ Applicable Regulation: CDR (EU) No 2020/2034

ERCS

2-Step process:

1) **Identification** of the severity of the potential accident outcome:
   a) Most likely type of accident that the occurrence under assessment could have escalated to (Key Risk Area) and the Potential Loss of Life
   b) Severity score (A, E, I, M, S, X)
2) **Determination** of the probability of the potential accident outcome:
   a) Identify which of the barriers (1-8) stopped the occurrence (stopping barrier) and the effectiveness of the remaining barriers (placed between the stopping barrier and the potential accident outcome)
   b) Sum of all the stopping/ remaining barrier weights (0-18) and barrier score (0-9)

European Risk Classification Scheme

This project is funded by the European Union and implemented by EASA

→ Applicable Regulation: CDR (EU) No 2020/2034

1) Identification: Potential Accident Outcome and Key Risk Area

1. Airborne Collision
2. Aircraft Upset
3. Collision on Runway
4. Excursion
5. Fire, Smoke, and Pressurization
6. Ground Damage
7. Obstacle Collision in Flight
8. Terrain Collision
9. Other Injuries
10. Security

European Risk Classification Scheme

This project is funded by the European Union and implemented by EASA

→ Applicable Regulation: CDR (EU) No 2020/2034

1) Identification: Potential Loss of Lives

1. More than 100 possible fatalities
2. Between 20 and 100 possible fatalities
3. Between 2 and 19 possible fatalities
4. 1 possible fatality
5. 0 possible fatalities.

European Risk Classification Scheme

This project is funded by the European Union and implemented by EASA

→ Applicable Regulation: CDR (EU) No 2020/2034

2) Determination: Severity scores.

These scores are obtained as a combination of the factors set in the identification phase:

A	No likelihood of an accident
E	Accident involving minor and serious injuries (not life changing) or minor damage.
I	Accident involving a single fatality, life changing injury or substantial damage.
M	Major accident with limited fatalities, life changing injuries or loss of the aircraft.
S	Significant accident with potential for fatalities and injuries,
X	Extreme catastrophic accident.

European Risk Classification Scheme

This project is funded by the European Union and implemented by EASA

→ Applicable Regulation: CDR (EU) No 2020/2034

2) Determination: Severity scores.

These scores are obtained as a combination of the factors set in the identification phase:

KEY RISK AREA	CATEGORY	SEVERITY SCORE
Airborne collision	More than 100 possible fatalities	X
	Between 20 to 100 possible fatalities	S
	Between 2 to 19 possible fatalities	M
	1 possible fatality	I

European Risk Classification Scheme

This project is funded by the European Union and implemented by EASA

→ Applicable Regulation: CDR (EU) No 2020/2034

2) Determination: Barriers.

1. Aircraft, Equipment, Infrastructure
2. Tactical Planning
3. Regulations, Procedures, Processes
4. Situational Awareness and Action
5. Warning Systems Operation and Action
6. Late Recovery
7. Protections
8. Low Energy Occurrence

European Risk Classification Scheme

This project is funded by the European Union and implemented by EASA

→ Applicable Regulation: CDR (EU) No 2020/2034

2) Determination: Barriers

Each of these barriers has a numerical value associated to it.

Barrier number	Barrier	Barrier weight
1	'Aircraft, equipment and infrastructure design', includes maintenance and correction, operation support, the prevention of problems related to technical factors that could lead to an accident.	5
2	'Tactical planning', includes organisational and individual planning prior to the flight or other operational activity that supports the reduction of the causes and contributors to accidents.	2
3	'Regulations, procedures, processes', includes effective, understandable and available regulations, procedures and processes that are complied with (with the exclusion of the use of procedures for recovery barriers).	3
4	'Situational awareness and action', includes human vigilance for operational threats which ensures identification of operational hazards and effective action to prevent an accident.	2
5	'Warning systems operation and action' that could prevent an accident and which are fit for purpose, functioning, operational and are complied with.	3
6	'Late recovery from a potential accident situation'	1
7	'Protections', when an event has occurred, the level of the outcome is mitigated or prevents the escalation of the occurrence by intangible barriers or providence	1
8	'Low energy occurrence' scores the same as 'Protections', but for low-energy key risk areas only (ground damage, excursions, injuries). 'Not applicable' for all other key risk areas.	1

European Risk Classification Scheme

This project is funded by the European Union and implemented by EASA

→ Applicable Regulation: CDR (EU) No 2020/2034

2) Determination: Barrier effectiveness

1. Stopped
2. Remaining Known
3. Remaining Assumed
4. Failed Assumed
5. Failed Known
6. Not Applicable

European Risk Classification Scheme

This project is funded by the European Union and implemented by EASA

→ Applicable Regulation: CDR (EU) No 2020/2034

2) Determination: Barrier effectiveness

The assessment involves two steps:

- **Step 1:** Identify the stopping barrier — the first one (from barriers 1 to 8) that effectively stopped the event from escalating into an accident.
- **Step 2:** Evaluate the effectiveness of the remaining barriers, i.e., those located after the stopping barrier but before the potential accident outcome.

Barriers before the stopping barrier are not considered relevant to the prevention of the accident and should not be marked as "Stopped" or "Remaining".

European Risk Classification Scheme

This project is funded by the European Union and implemented by EASA

→ Applicable Regulation: CDR (EU) No 2020/2034

Determination: Barrier effectiveness

Barrier weight sum	Corresponding barrier score
0 No barriers left. Worst likely accident outcome realised.	0
1-2	1
3-4	2
5-6	3
7-8	4
9-10	5
11-12	6
13-14	7
15-16	8
17-18	9

European Risk Classification Scheme

This project is funded by the European Union and implemented by EASA

SEVERITY		CLASSIFICATION (ERCS Score)										
Potential Accident Outcome	Score											
Extreme catastrophic accident with the potential for significant number of fatalities (100+)	X	X9	X8	X7	X6	X5	X4	X3	X2	X1		X0
Significant accident with potential for fatalities and injuries (20-100)	S	S9	S8	S7	S6	S5	S4	S3	S2	S1		S0
Major accident with limited amount of fatalities (2-19), life changing injuries or destruction of the aircraft	M	M9	M8	M7	M6	M5	M4	M3	M2	M1		M0
An accident involving single individual fatality, life changing injury or substantial aircraft damage	I	I9	I8	I7	I6	I5	I4	I3	I2	I1		I0
An accident involving minor and serious injury (not life changing) or minor aircraft damage	E	E9	E8	E7	E6	E5	E4	E3	E2	E1		E0
No likelihood of an accident	A	*No Implication to Safety*										
	Corresponding Barrier Score	9	8	7	6	5	4	3	2	1		0
	Barrier Weight Sum	17-18	15-16	13-14	11-12	9-10	7-8	5-6	3-4	1-2		0
		PROBABILITY OF THE POTENTIAL ACCIDENT OUTCOME										

Pending Risk Assessment

RED

High risk

Yellow

Elevated or intermediate risk

Green

Low risk occurrences

European Risk Classification Scheme

This project is funded by the European Union and implemented by EASA

→ Applicable Regulation: CDR (EU) No 2020/2034

Numerical equivalent score:

ERCS Score	X9	X8	X7	X6	X5	X4	X3	X2	X1	X0
Corresponding numerical value	0,001	0,01	0,1	1	10	100	1000	10000	100000	1000000
ERCS Score	S9	S8	S7	S6	S5	S4	S3	S2	S1	S0
Corresponding numerical value	0,0005	0,005	0,05	0,5	5	50	500	5000	50000	500000
ERCS Score	M9	M8	M7	M6	M5	M4	M3	M2	M1	M0
Corresponding numerical value	0,0001	0,001	0,01	0,1	1	10	100	1000	10000	100000
ERCS Score	I9	I8	I7	I6	I5	I4	I3	I2	I1	I0
Corresponding numerical value	0,00001	0,0001	0,001	0,01	0,1	1	10	100	1000	10000
ERCS Score	E9	E8	E7	E6	E5	E4	E3	E2	E1	E0
Corresponding numerical value	0,000001	0,00001	0,0001	0,001	0,01	0,1	1	10	100	1000

Both column 10 and the row A in the matrix bear the value 0 as the corresponding numerical value.

ERCS: Practical examples and case studies

This project is funded by the European Union and implemented by EASA

→ Applicable Regulation: CDR (EU) No 2020/2034

ERCS Learning Module:

https://rise.articulate.com/share/4cdIH0fFRIp9pghcJeNV5c0y2zoz3hbA#/

ERCS: Practical examples and case studies

This project is funded by the European Union and implemented by EASA

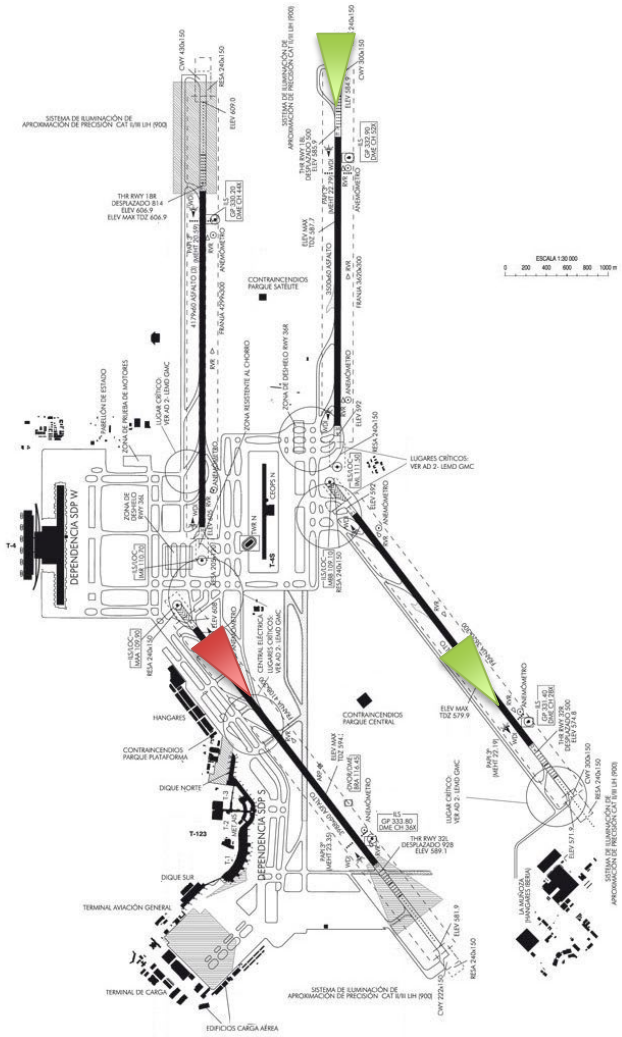
→ European Risk Classification Scheme - ERCS

Aircraft narrative

B737. Training flight with a safety pilot. The tower cleared us to enter and line up on runway 14R as soon as we reached the holding point. When we activated the weather radar (WX), we focused on analysing the situation, as the weather conditions were very poor. After completing our analysis, believing we had takeoff clearance, we departed. Upon passing 4000 ft, the tower informed us that we did not have takeoff clearance and that a report would need to be filed.

ATC Narrative

A/C 1 was cleared to enter and hold on runway 14R. Without receiving takeoff clearance from ATC, it began its takeoff roll. Due to the aircraft's speed, it was not instructed to abort takeoff for safety reasons. The aircraft did not have takeoff clearance because of an inbound aircraft on runway 18L and another aircraft simultaneously departing from runway 14L. Approach control had requested single-sequence departures due to weather conditions.



ERCS: Practical examples and case studies

This project is funded by the European Union and implemented by EASA

→ European Risk Classification Scheme - ERCS

QUESTION 1

If this event had led to an accident, what kind of accident would it have been? And what would have been the potential severity?

Select the most credible accident outcome (Key Risk Area):

- ○ Airborne Collision
- ○ Aircraft Upset (Loss of Control)
- ○ Excursions
- ○ Ground Damage
- ○ Injuries
- ○ Obstacle Collision in Flight
- ○ Runway Collision
- ○ Terrain Collision
- ○ Unsurvivable Aircraft Environment
- ○ Not safety related

SEVERITY			
Potential Accident Outcome	Reference value	Score	Points
Extreme catastrophic accident with significant potential fatalities (100+)	1000	X	*1000000*
Significant accident with significant potential for fatalities and injuries (20-100)	100	S	*500000*
Major accident with potential for some fatalities/life changing injuries (2-19) or major aircraft destroyed	10	M	*100000*
Single Individual fatality/life changing injury or substantial damage accident	1	I	*10000*
Minor and Serious Injury (not life changing) accidents and Minor Damage	0,01	E	*1000*
	0	A	*0*

ERCS: Practical examples and case studies

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→ European Risk Classification Scheme - ERCS

QUESTION 2
What was the effectiveness of the remaining barriers between this event and the most credible scenario?

Probability is determined by scoring the behavior of the barriers.

Systemic barriers

Operational barriers

Barrier number	Barrier	Barrier weight
1	'Aircraft, equipment and infrastructure design', includes maintenance and correction, operation support, the prevention of problems related to technical factors that could lead to an accident.	5
2	'Tactical planning', includes organisational and individual planning prior to the flight or other operational activity that supports the reduction of the causes and contributors to accidents.	2
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6	'Late recovery from a potential accident situation'	1
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8	'Low energy occurrence' scores the same as 'Protections', but for low-energy key risk areas only (ground damage, excursions, injuries). 'Not applicable' for all other key risk areas.	1

- Not applicable
- Failed
- Failed
- ACC prevented it from escalating
- It is assumed that they were still active

ERCS: Practical examples and case studies

This project is funded by the European Union and implemented by EASA

→ European Risk Classification Scheme - ERCS

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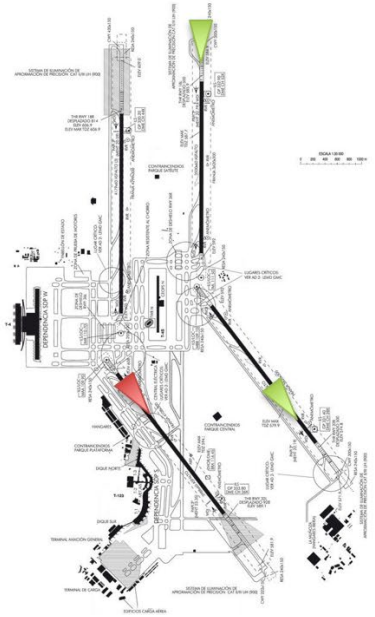

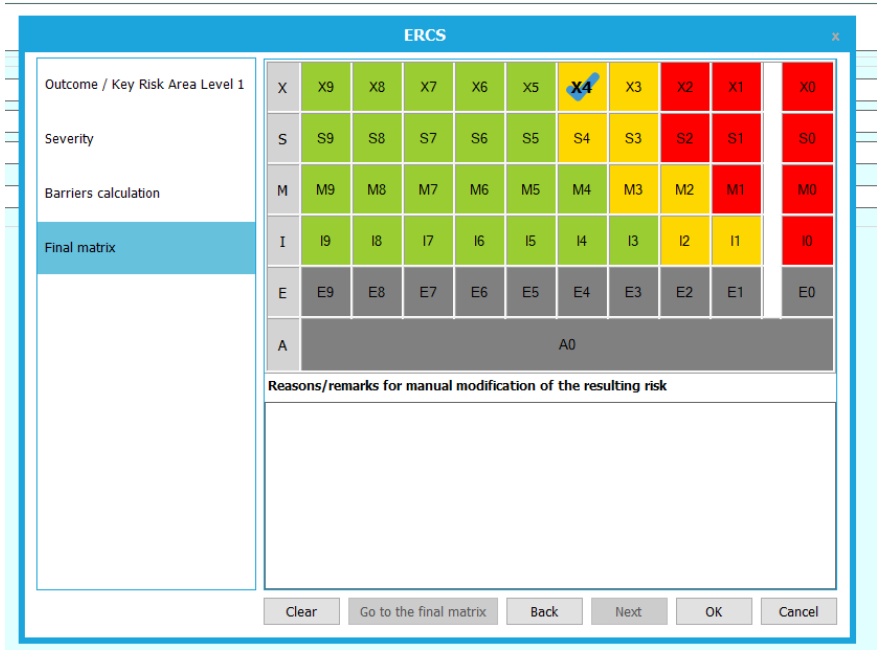

Risk Classification

This project is funded by the European Union and implemented by EASA

→ European Risk Classification Scheme - ERCS

Aircraft narrative

Piper PA28. Instruction flight. During take-off from Runway 27, at 400 feet AGL, a significant-sized bird strike occurs on the co-pilot's side, hitting the engine cowling. The crew returns to the field, performing a left-hand downwind to Runway 27. The aircraft lands without incident.

Airport narrative

Aircraft on final approach reports a bird strike and requests to land. The crew reports damage to the aircraft; although no emergency is declared, the emergency alarm is activated. At 08:01, the aircraft lands and taxis to parking, escorted by the airport rescue and firefighting service (RFFS). A runway inspection is carried out, after which operations resume.

The airside safety coordinator inspects the aircraft and observes a dent on the front right section of the nose. Upon inquiry, the pilot mentions it may have struck a raptor (white and brown), suggesting a possible collision with a booted eagle (Hieraaetus pennatus) or a common buzzard (Buteo buteo, light phase).

Proposed corrective actions: review of the falconry program and increased presence of falconers.

ERCS: Practical examples and case studies

This project is funded by the European Union and implemented by EASA

→ European Risk Classification Scheme - ERCS

QUESTION 1

If this event had led to an accident, what kind of accident would it have been? And what would have been the potential severity?

Select the most credible accident outcome (Key Risk Area):

○ Airborne Collision	○ Aircraft Upset (Loss of Control)
○ Excursions	○ Ground Damage
○ Injuries	○ Obstacle Collision in Flight
○ Runway Collision	○ Terrain Collision
○ Unsurvivable Aircraft Environment	○ Not safety related

SEVERITY			
Potential Accident Outcome	**Reference Value**	**Score**	**Points**
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What was the effectiveness of the remaining barriers between this event and the most credible scenario?

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Systemic barriers

Operational barriers

Barrier number	Barrier	Barrier weight	
1	'Aircraft, equipment and infrastructure design', includes maintenance and correction, operation support, the prevention of problems related to technical factors that could lead to an accident.	5	Failed
2	'Tactical planning', includes organisational and individual planning prior to the flight or other operational activity that supports the reduction of the causes and contributors to accidents.	2	Not applicable
3	'Regulations, procedures, processes', includes effective, understandable and available regulations, procedures and processes that are complied with (with the exclusion of the use of procedures for recovery barriers).	3	ACC prevented it from escalating
4	'Situational awareness and action', includes human vigilance for operational threats which ensures identification of operational hazards and effective action to prevent an accident.	2	It is assumed to have failed
5	'Warning systems operation and action' that could prevent an accident and which are fit for purpose, functioning, operational and are complied with.	3	Not applicable
6	'Late recovery from a potential accident situation'	1	It is assumed to be active
7	'Protections', when an event has occurred, the level of the outcome is mitigated or prevents the escalation of the occurrence by intangible barriers or providence	1	It is assumed to be active
8	'Low energy occurrence' scores the same as 'Protections', but for low-energy key risk areas only (ground damage, excursions, injuries). 'Not applicable' for all other key risk areas.	1	

ERCS: Practical examples and case studies

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Barrier weight sum	Corresponding barrier score
0 No barriers left. Worst likely accident outcome realised.	0
1-2	1
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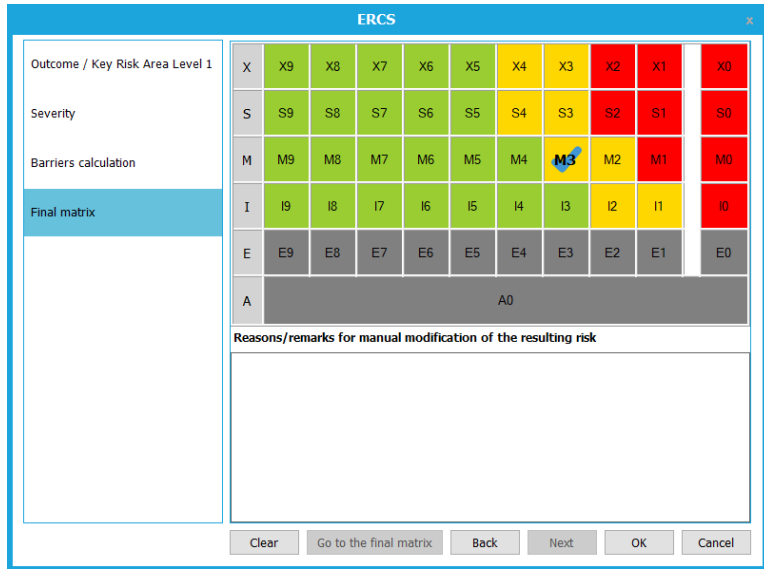
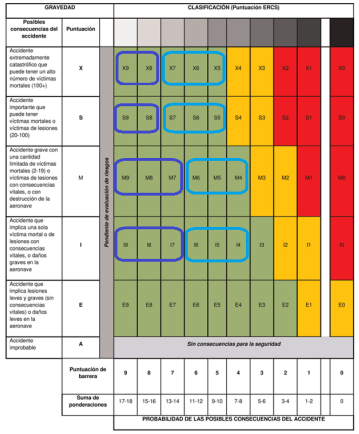


Risk Classification

→ European Risk Classification Scheme - ERCS

This project is funded by the European Union and implemented by EASA



Relevant events

ERCS MANUAL

- ✓ Key Risk Area: Credible Worst-Case Scenario
- ✓ Severity
- ✓ Barrier analysis: Barrier that stops the development of the incident
- ✓ Barrier Analysis: Barriers That Remain and Fail
- ✓ Value of ERCS

AUTOMATIC ERCS

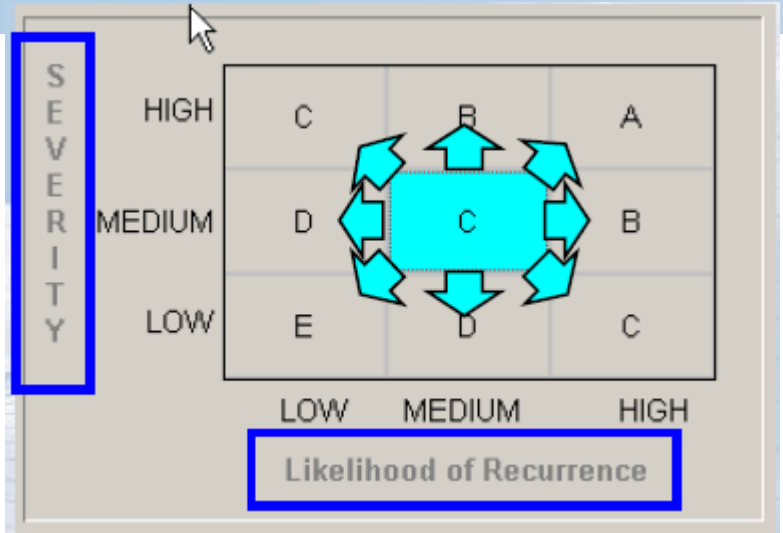
- ✓ Key Risk Area: Worst Credible Scenario
- ✓ Severity
- ✓ Probability: Based on the number of events
- ✓ ERCS Value (European Risk Classification Scheme)

Other safety risk classification methodologies

This project is funded by the European Union and implemented by EASA

AIRLINE RISK MANAGEMENT SOLUTIONS (ARMS)

- You learn about an event which took place yesterday:
  - A single-aisle aircraft with 110 pax almost overran runway end at landing
  - Actual outcome: a few blown tires
  - Cause: reduced braking capability due to maintenance error



Other safety risk classification methodologies

This project is funded by the European Union and implemented by EASA

AIRLINE RISK MANAGEMENT SOLUTIONS (ARMS)

- **Severity of what?**
  - Actual outcome: blown tires?
  - Most likely potential accident scenario: overshoot with some injuries & few fatalities (if any)?
  - The worst-case scenario: overshoot with 100% fatalities?
  - Shall you consider bigger A/C? More pax? Critical airports?

- **Probability of what?**
  - The same maintenance error?
  - Near-overshoot events?
  - Actual overshoot events?
  - Any A/C type? Any location?

Other safety risk classification methodologies

This project is funded by the European Union and implemented by EASA

AIRLINE RISK MANAGEMENT SOLUTIONS (ARMS)

1. Conceptual confusion on historical events
2. Confusion between events and Safety Issues
3. Should not limit thinking to actual outcomes
4. Potential outcomes are very subjective
5. Complexity of real world: makes situation worse
6. Complexity of barriers: difficult to estimate effectiveness
7. Guidance should not link with actual outcome only
8. Guidance should not be too vague either

Other safety risk classification methodologies

This project is funded by the European Union and implemented by EASA

AIRLINE RISK MANAGEMENT SOLUTIONS (ARMS)

Safety Issue:
A manifestation of a hazard or combination of several hazards in a specific context. The Safety Issue has been identified through the systematic Hazard Identification process of the organization. A SI could be a local implication of one hazard (e.g. de-icing problems in one particular aircraft type) or a combination of hazards in one part of the operation (e.g. operation to a demanding airport). (ARMS)

Examples:
Windshear at approach to XXX
Quality of de-icing in YYY
Operation into ZZZ (high-altitude, short runway, …)
Fatigue on red-eye flights
Excess carry-on luggage on certain routes

Other safety risk classification methodologies

This project is funded by the European Union and implemented by EASA

AIRLINE RISK MANAGEMENT SOLUTIONS (ARMS) Process:

1. **Hazard Identification**
2. **Event Risk Classification ERC:**

Question 2

What was the effectiveness of the remaining barriers between this event and the most probable accident scenario?			
Effective	Limited	Minimal	Not effective
50	102	502	2500
10	21	101	500
2	4	20	100
1			

Question 1

If this event had escalated into an accident, what would have been the most probable outcome?		Typical accident scenarios
Catastrophic Accident	Loss of aircraft or multiple fatalities (3 or more)	Loss of control, mid air collision, uncontrollable fire on board, explosions, total structural failure of the aircraft, collision with terrain
Major Accident	1 or 2 fatalities, multiple serious injuries, major damage to the aircraft	High speed taxiway collision, major turbulence injuries
Minor Injuries or damage	Minor injuries, minor damage to aircraft	Pushback accident, minor weather damage
No accident outcome	No potential damage or injury could occur	Any event which could not escalate into an accident, even if it may have operational consequences (e.g. diversion, delay, individual sickness)

Other safety risk classification methodologies

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Event Risk Classification ERC:

Air Safety Report:

TCAS "Climb" RA in uncontrolled airspace on a low-level transit. TC clearance for low level transit was "Rwy 01, VFR departure, left turn back to XX NDB, then heading 115º for 20 NM, thereafter to YYY, initial altitude 2300 ft." The crew wished to join controlled airspace but were offered this departure by ATC.

After take-off they were given Radar Service and Deconfliction Service. Speed was 180 kt, heading was 105º, about 15 to 20 NM from XX NDB. The crew was constantly receiving traffic advisories and avoidance headings from Radar Service to avoid traffic. The airspace was full with VFR aircraft and TCAS showed constantly 5 and more aircraft at a range of 5 NM. Crew was highly alerted to monitor and identify traffic and requested again to join controlled airspace.

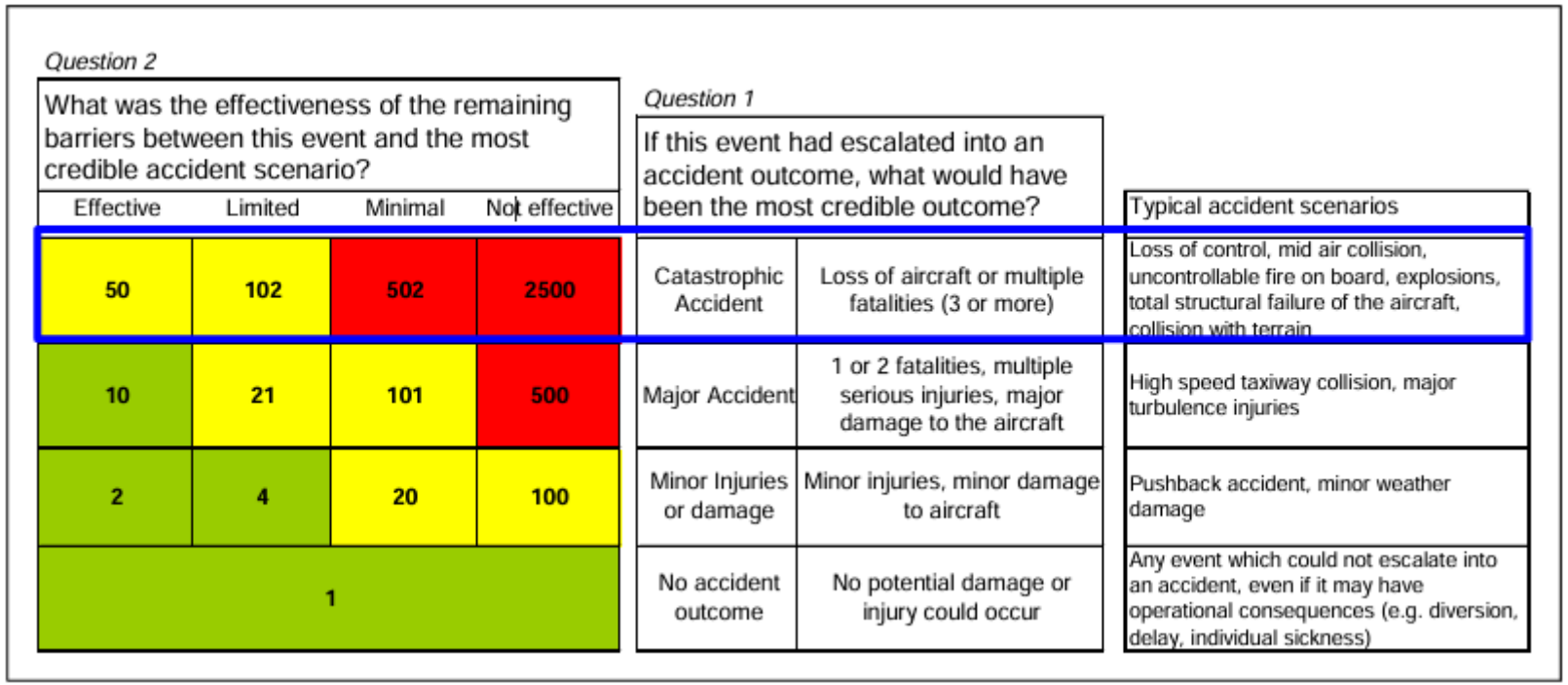
Although avoidance headings had been given, a TCAS Climb RA was triggered with 2000ft/min or more. After clear of conflict the crew descended back to 2300ft and reported back to Radar

Other safety risk classification methodologies

This project is funded by the European Union and implemented by EASA

Event Risk Classification ERC:

Question 1: "If this event had escalated into an accident, what would have been the most credible accident outcome?"



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Other safety risk classification methodologies

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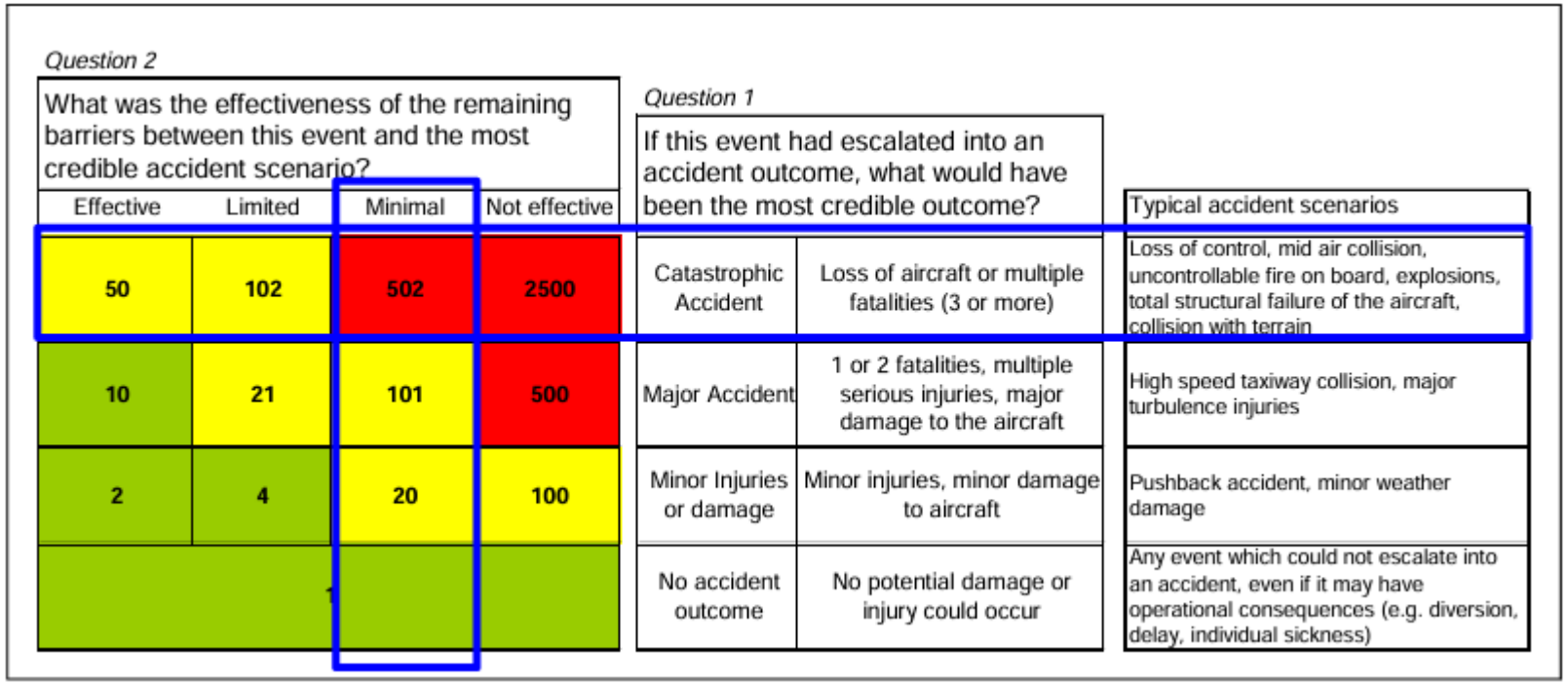
Event Risk Classification ERC:

Question 2: "What was the effectiveness of the remaining barriers between this event and the most credible accident outcome?"



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Other safety risk classification methodologies

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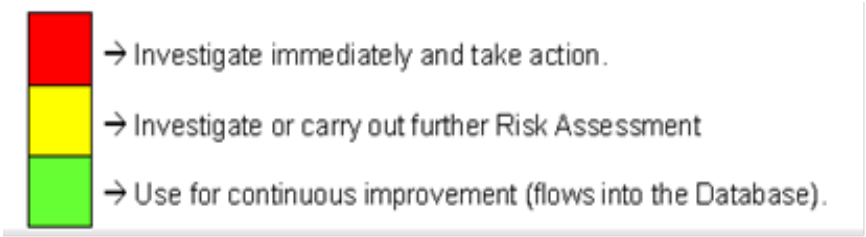
Process steps

3. **ERC Outputs:**
   - ✓ What should be done about the event:



   - ✓ A number, called the risk index: The Index is an estimated risk value

4. **Investigation**
5. **Data Analysis:**

   Looking at Safety data statistics to identify Safety Issues

   Safety Issue is the manifestation of a hazard or combination of several hazards in the specific context of your operation

6. **Safety Issue Risk Assessment SIRA: 4 factors**

   Frequency/probability of the Triggering Event

   Effectiveness of the Avoidance Barriers

   Effectiveness of the Recovery Barriers

   Severity of the (most probable) accident outcome

Other safety risk classification methodologies

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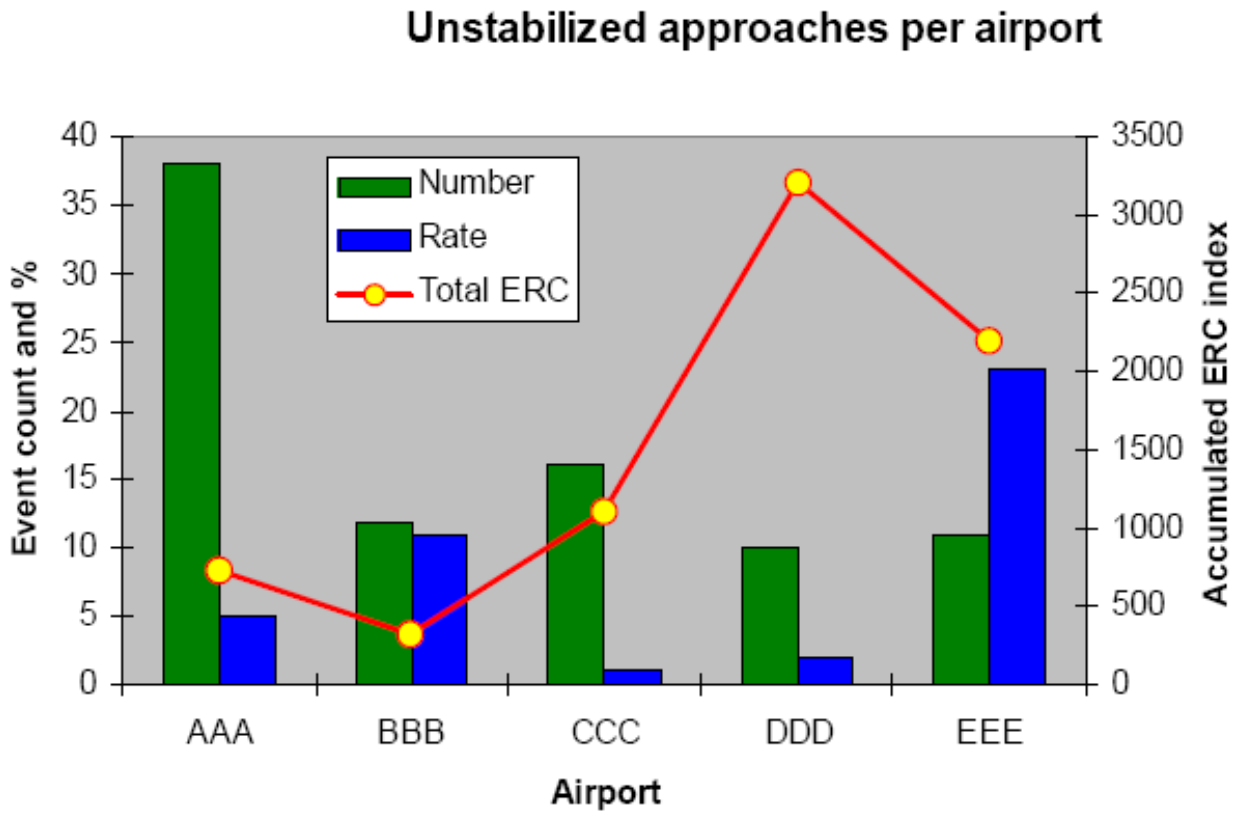
Data Analysis:



Other safety risk classification methodologies

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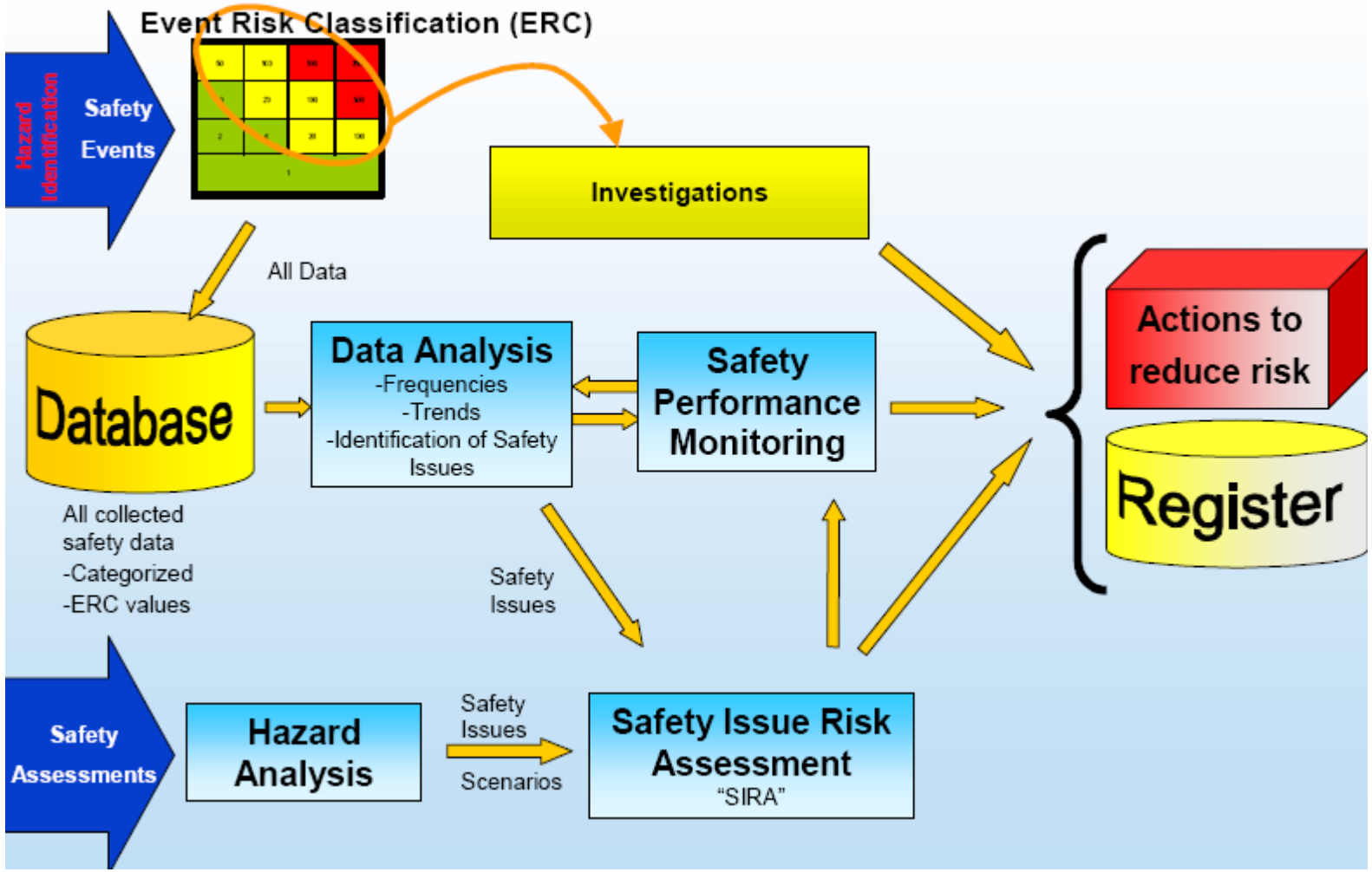
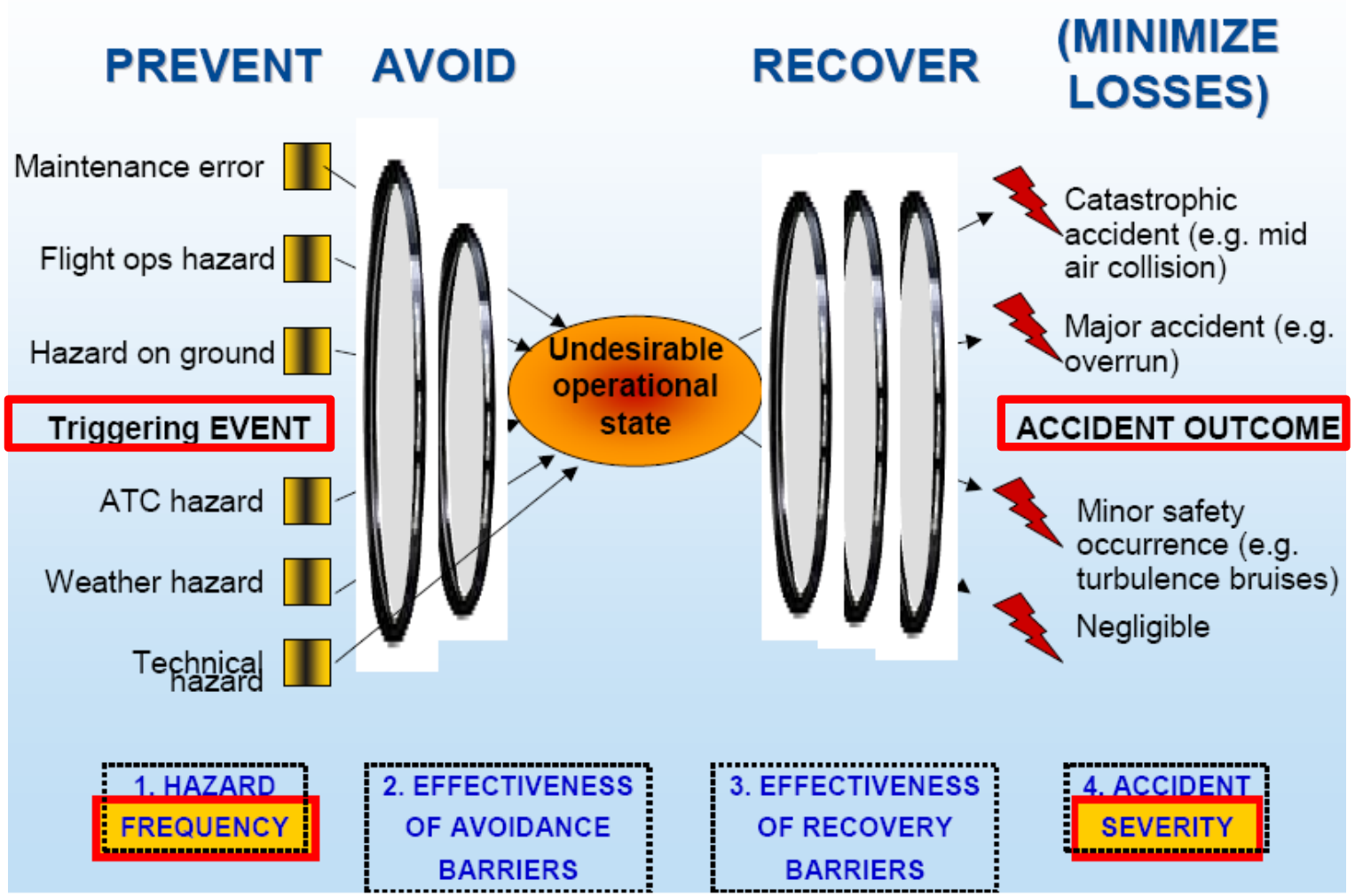
ARMS PROCESS SUMMARY



Other safety risk classification methodologies

This project is funded by the European Union and implemented by EASA

SIRA



Other safety risk classification methodologies

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SIRA

An incident happening to another company motivates the MRO "MyMx" to study the Safety Issue of cross-connecting the flight controls (left-right or push-pull). MyMx has no idea how improbabe it is that such a maintenance error could take place.

Step 1: Define the Safety Issue precisely

The Safety Issue is an accident (at takeoff) due to cross-connected flight controls of the Pilot Flying (PF). MyMx currently is maintaining only Airbus fly-by-wire aircraft, so these will be the a/c types under study.

SAFETY ISSUE RISK ASSESSMENT (SIRA) TOOL		
1	Safety Issue title:	Accident (at takeoff) due to cross-connected flight controls of the Pilot Flying (PF).
2	Define/scope the SI:	
	Description of Hazard(s)	Maintenance error where flight control wires are cross-connected on one or both sides.
	Description of Scenario	The accident scenario is total loss of the aircraft due to handling problems after lift-off (Loss Of Control, LOC).
	A/C types	Airbus fly-by-wire
	Locations	At MRO homebase airport
	Time period under study	Next 12 months.
	Other	

Other safety risk classification methodologies

This project is funded by the European Union and implemented by EASA

SIRA

Step 2: Develop the related accident scenarios.

The accident scenario is total loss of the aircraft due to handling problems after lift-off (Loss Of Control, LOC).

Step 3: Analyse the Scenario using the SIRA model:

- The triggering Event is the maintenance error of cross-connecting the wires on one or both sides (capt/first officer). This must involve cross connecting both the command and monitoring channels, otherwise the aircraft itself would detect the problem.
- The Undesirable Operational State can be defined as “taking off with an aircraft with the above maintenance error”. (note that the UOS always takes place within the Flight Operation)
- The accident is LOC at takeoff.
- With the above definitions, the Avoidance barriers are: any actions post-maintenance that would enable either the MyMx or the operating flight crew to detect the problem before (or latest during) the takeoff roll.
- The recovery barriers are flight crew actions enabling a safe flight despite the aircraft taking off with cross connected controls.

Other safety risk classification methodologies

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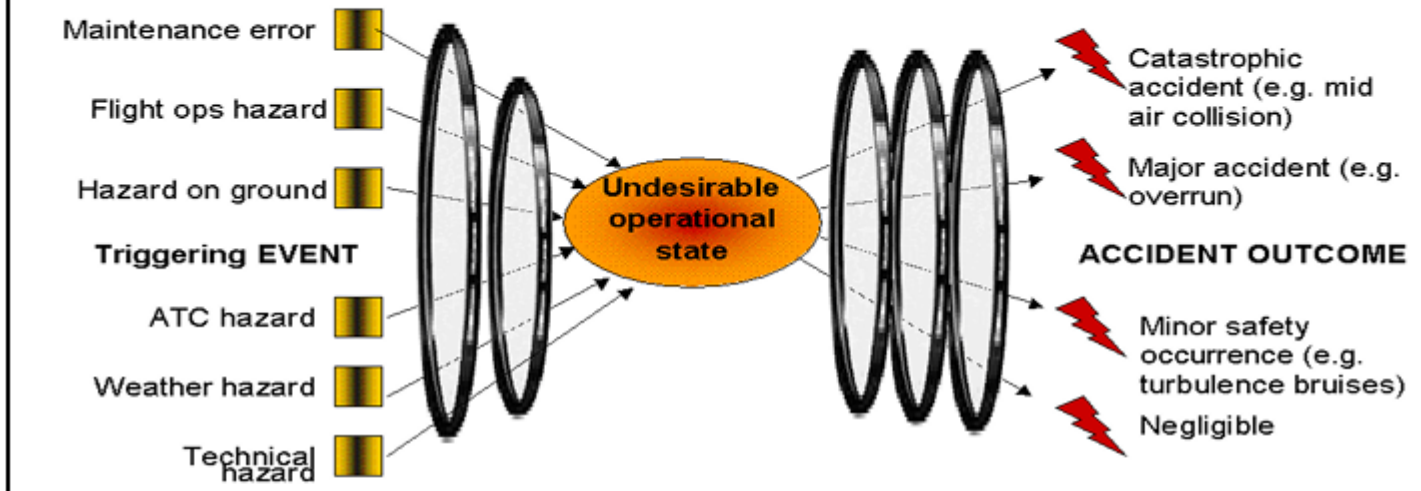
SIRA

	3.1 Triggering event		3.2 Undesirable Operational State		3.3 Accident Outcome
	Maintenance error where both command and monitoring channels are cross-connected.		Taking off with an aircraft with the above maintenance error		Loss of control at takeoff after liftoff.



4	Describe the barriers				
		4.1 To avoid the UOS		4.2 To recover before the Accident	
		The maintenance team is supposed to make an operational check after the maintenance task. This barrier could fail either because the check is omitted or not done carefully enough ("it moves" is not enough, the direction needs to be correct). Estimated conservative failure rate is: 1/100 times. During taxi-out, the pilots make a flight controls check. This may fail for the same reasons as for the maintenance team. The estimated failure rate is the same 1/100.		· The Recovery Barrier consists of two things: either only one side is affected and by luck the Pilot Not Flying (PNF) side; or the PF manages to control the aircraft despite the cross-connection. This is deemed very difficult and subject to wind effects just after lift-off.	

Other safety risk classification methodologies

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SIRA

5	**Risk Assessment**				
	The estimated frequency of the triggering event (per flight sectors) is:	The barriers will **fail** in AVOIDING the UOS...		The barriers will **fail** in RECOVERING the situation before the ACCIDENT...	The accident severity would be...
	About every 100000 sectors	Once in 10 000 times		Practically always	Catastrophic
	1.E-05	1.E-04		1.E+00	
			UOS frequency:		**Mean Accident frequency:**
			1.E-09		1.E-09
6	**Result**				
	6.1 Resulting risk class	**Secure**			
	Comments on actions:				

Other safety risk classification methodologies

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- ARMS aims to be pragmatic and useful, while remaining conceptually robust
- The methodology is available to the whole industry; SIRA excel tool provides support to operators
- ARMS is not limited to current outcomes; same SIRA method can be applied to future risks "safety assessment"
- The methodology takes into account both the preventive and recovery barriers
- Barriers complexity may produce no-realistic probability-of-failure calculations if appropriate probabilistic models are not used
- The methodology may fall short in some cases, particularly those involving human factors
- Severity assessment is based on "the most probable accident outcome"; it incorporates some subjectivity

European Risk Classification Scheme

This project is funded by the European Union and implemented by EASA

COMMISSION IMPLEMENTING REGULATION (EU) 2021/2082

of 26 November 2021

laying down the arrangements for the implementation of Regulation (EU) No 376/2014 of the European Parliament and of the Council as regards the common European risk classification scheme

It lays down the detailed rules for the implementation of Regulation (EU) No 376/2014 of the European Parliament and of the Council as regards the common European risk classification system

Mostly, it explains how to translate RAT and ARMS scores to ERCS scores.

European Risk Classification Scheme

This project is funded by the European Union and implemented by EASA

→ Applicable Regulation: CIR (EU) No 2021/2082

Further implementation of ERCS

This regulation makes mandatory for each authority the monitorization of its own use of the ERCS. First expected on 31 March 2026 and every 5 years thereafter.

Conversion procedures

To improve interoperability with other risk classification schemes, the regulation provides the criteria to adapt to the ERCS the values of:

- ARMS-ERC: **E**vent **R**isk **C**lassification developed by **A**irline **R**isk **M**anagement **S**olutions. Mainly used by Airlines.
- RAT: **R**isk **A**nalysis **T**ool developed by EUROCONTROL for ATM-related occurrences.

European Risk Classification Scheme

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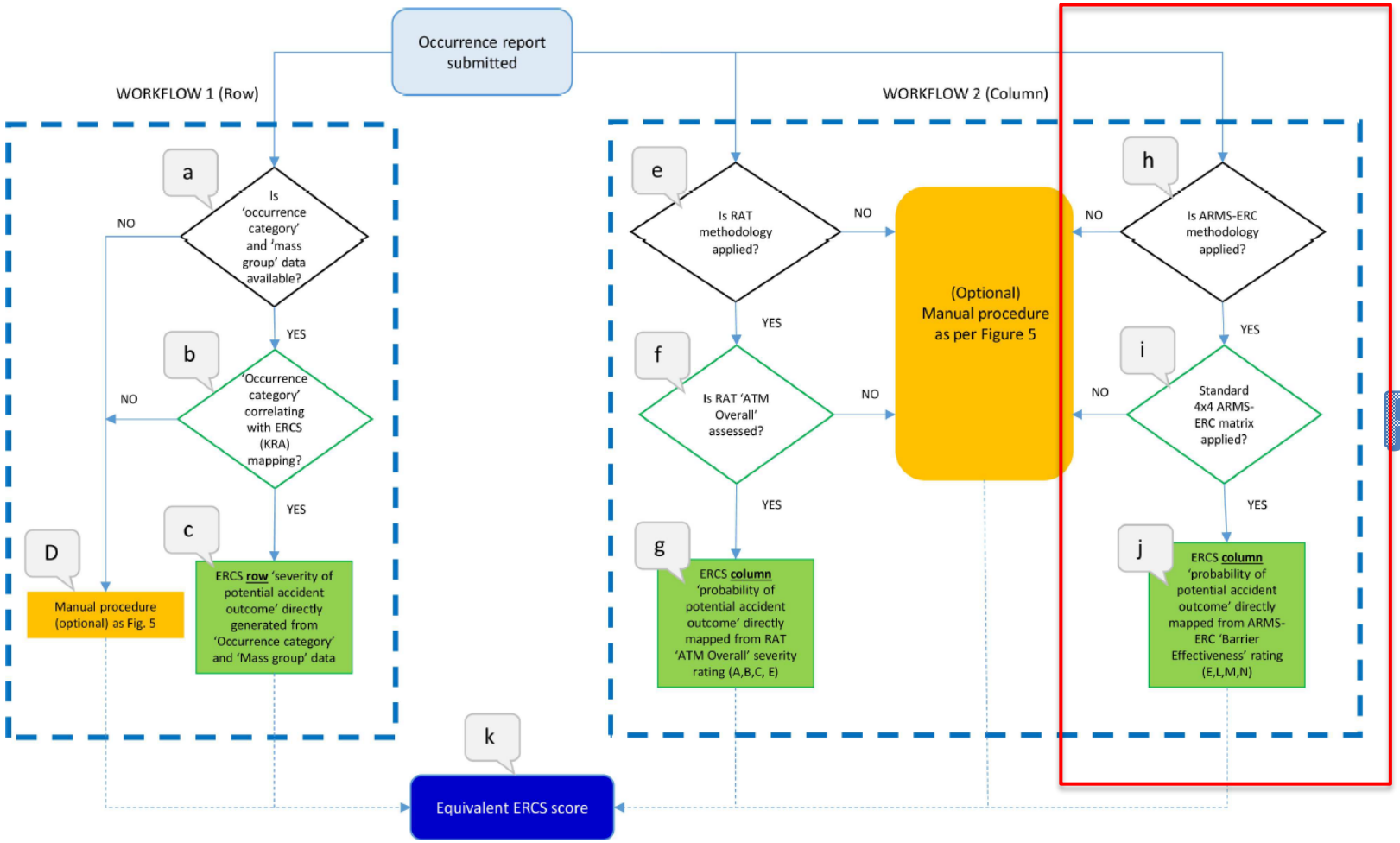
→ Applicable Regulation: CIR (EU) No 2021/2082

Conversion from RAT and ARMS-ERC to ERCS – Direct Conversion

ERCS Severity Score



ERCS Probability Score

European Risk Classification Scheme

This project is funded by the European Union and implemented by EASA

→ Applicable Regulation: CIR (EU) No 2021/2082

Conversion from RAT and ARMS-ERC to ERCS – Direct Conversion

At point (i)

Question 2

What was the effectiveness of the remaining barriers between this event and the most probable accident scenario?

Effective	Limited	Minimal	Not effective
50	102	502	2500
10	21	101	500
2	4	20	100
1			

Question 1

If this event had escalated into an accident, what would have been the most probable outcome?		Typical accident scenarios
Catastrophic Accident	Loss of aircraft or multiple fatalities (3 or more)	Loss of control, mid air collision, uncontrollable fire on board, explosions, total structural failure of the aircraft, collision with terrain
Major Accident	1 or 2 fatalities, multiple serious injuries, major damage to the aircraft	High speed taxiway collision, major turbulence injuries
Minor Injuries or damage	Minor injuries, minor damage to aircraft	Pushback accident, minor weather damage
No accident outcome	No potential damage or injury could occur	Any event which could not escalate into an accident, even if it may have operational consequences (e.g. diversion, delay, individual sickness)

European Risk Classification Scheme

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→ Applicable Regulation: CIR (EU) No 2021/2082

Conversion from RAT and ARMS-ERC to ERCS – Direct Conversion

At point (i)

Effective | Limited | Minimal | Not effective

ERCS Probability categories

Corresponding Barrier Score	9	8	7	6	5	4	3	2	1	0
Barrier Weight Sum	17-18	15-16	13-14	11-12	9-10	7-8	5-6	3-4	1-2	0
Probability	10^{-9}	10^{-8}	10^{-7}	10^{-6}	10^{-5}	10^{-4}	10^{-3}	10^{-2}	10^{-1}	1
Description	Remaining barriers preedicted to fail 1 in 1,000M times	Remaining barriers preedicted to fail 1 in 100M times	Remaining barriers preedicted to fail 1 in 10M times	Remaining barriers preedicted to fail 1 in 1M times	Remaining barriers preedicted to fail 1 in 100,000 times	Remaining barriers preedicted to fail 1 in 10,000 times	Remaining barriers preedicted to fail 1 in 1,000 times	Remaining barriers preedicted to fail 1 in 100 times	Remaining barriers preedicted to fail 1 in 10 times	Realised accidents

Interface Risks

This project is funded by the European Union and implemented by EASA

What are Interface Risks?

- Risks emerging at the **boundaries between systems, organisations, or operational functions**.
- Common in shared responsibilities across **ANSPs, airports, airlines, maintenance organisations**, and **regulators**.
- Often **overlooked** because each party assumes the other manages the risk.

Typical Examples of Interface Risks

- Poor handovers between ATC units (e.g., missed altitude change).
- Misaligned procedures between airport ground ops and airlines (e.g., stand allocation, pushback clearance).
- Divergence between ATC instructions and acft. operations (e.g., pilot misinterpreting a clearance, late acknowledgment, or deviation due to workload or acft. limitations).

Interface Risks

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Managing Interface Risks in SSP/SMS: Key Actions

- **Joint risk assessments** between stakeholders with shared responsibilities.
- **Clear role definitions** and accountability at operational and management levels.
- **Standardised communication protocols** and cross-organisational procedures.

In SMS/SSP context

- Interface risks must be **explicitly addressed in hazard identification and risk assessment** processes.
- Events involving multiple organisations should trigger **collaborative investigation and learning**.
- **Data sharing agreements** are essential to ensure visibility across interfaces.

Interface Risks

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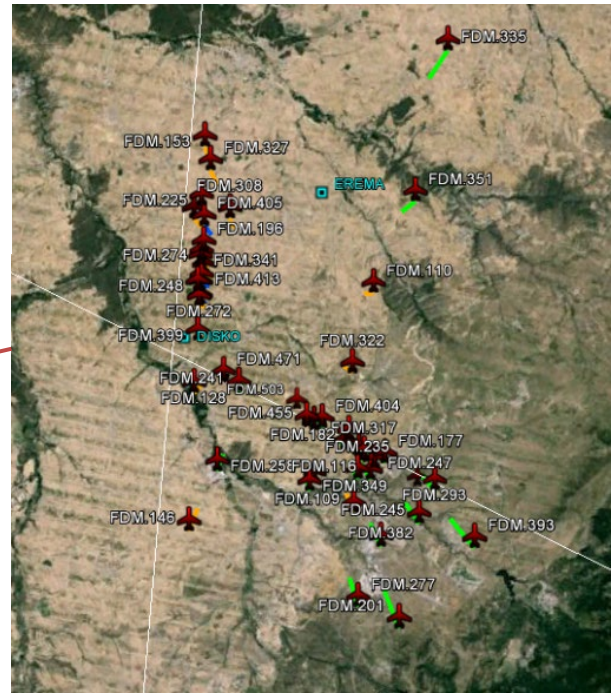
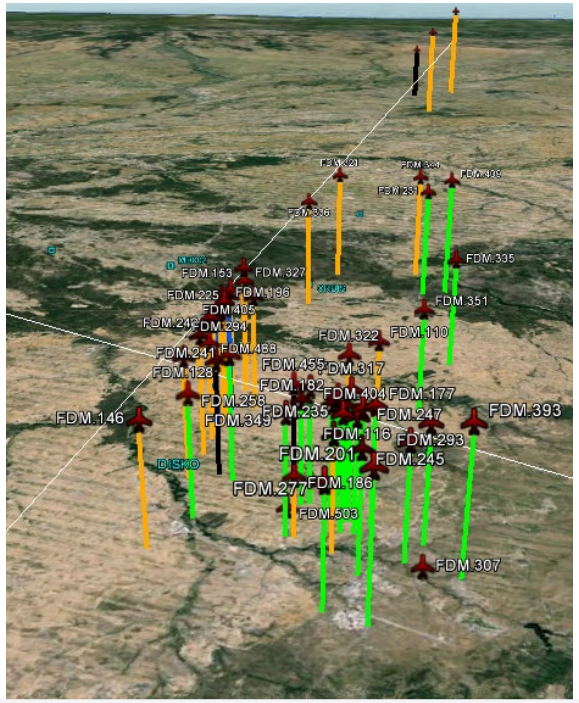
- **1ST Cluster (57 FDM): Near DISKO-EREMA**
  - **Intersection of two airways: UN864 (cruise) & UN733 (climb)**
  - **Most of the TCAS RA alerts produced by the rate of climb**

Over recent years, within Spanish airspace, it has been observed that a substantial percentage of ACAS RA are issued when aircraft are instructed by ATC to level off with 1000 feet difference and, at the same time, they cross in the horizontal plane. ACAS RA are the result of the climb or descent of aircraft maintaining a high vertical speed as they approach the altitude assigned by ATC.





Reported occurrence were revised to extract pilots' and air traffic controllers'' opinion

Interface Risks

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- 1ST Cluster (57 FDM): Near DISKO-EREMA
  - ✈ **Intersection of two airways: UN864 (cruise) & UN733 (climb)**

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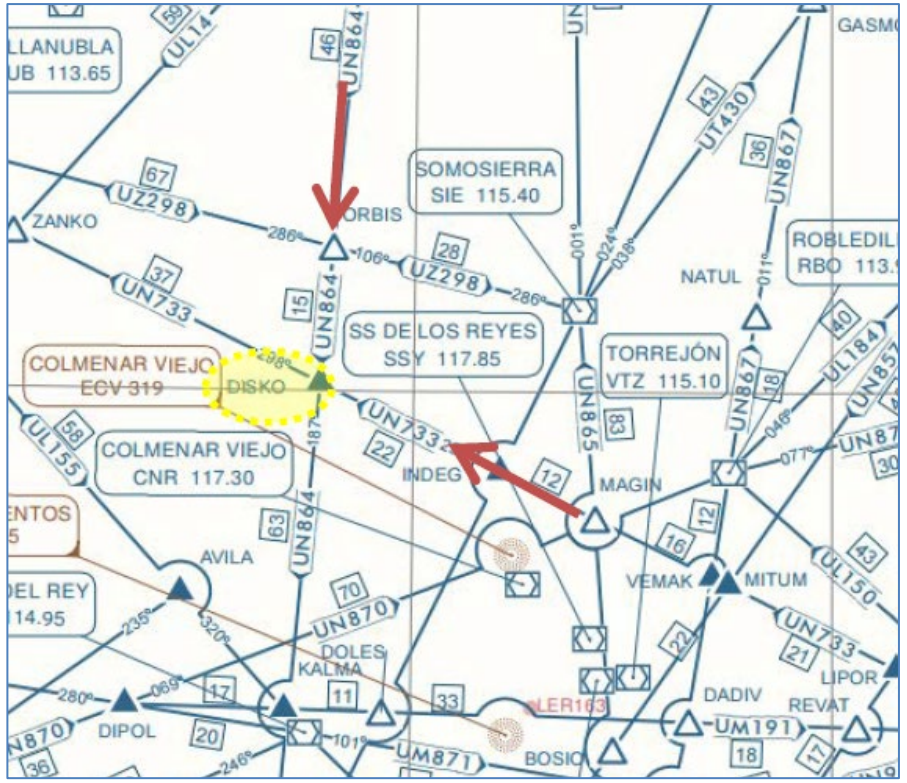
AIC
7/16
23-JUN-16

RESTRICCIÓN DE VELOCIDAD VERTICAL A TODAS LAS AERONAVES EN EVOLUCIÓN
VERTICAL SPEED RESTRICTIONS FOR ALL EVOLVING AIRCRAFT

In these circumstances, the vertical speed shall be reduced to 1500 feet per minute when approaching a vertical distance of 1000 feet above or below the assigned altitude or flight level.

Following application of the measure in a first phase in the TMA of Madrid, the benefits entailed by the same indicate that it is appropriate to extend it to all the TMA of Spanish airspace: Madrid, Barcelona, Palma, Valencia, Canarias, Sevilla, Almería, Asturias, Bilbao, Galicia and Santander.



EASA
European Union Aviation Safety Agency

This project is funded by the European Union
and implemented by EASA

Effective Aviation Safety Occurrence Reporting Systems: Implementation and Use in SSP/SMS

EU-Africa Safety in Aviation (EU-ASA) Project

Dates: 15–18 July
Online: Zoom

easa.europa.eu/connect

Your safety is our mission.

An Agency of the European Union