

AI and Data 4 Safety

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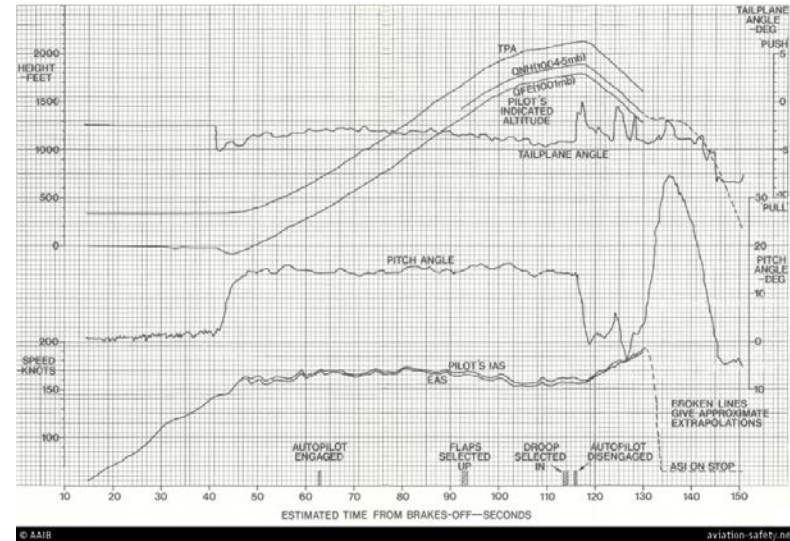
Your safety is our mission.

Safety Occurrence Reporting

→ A 1960s idea, established in the 1970s

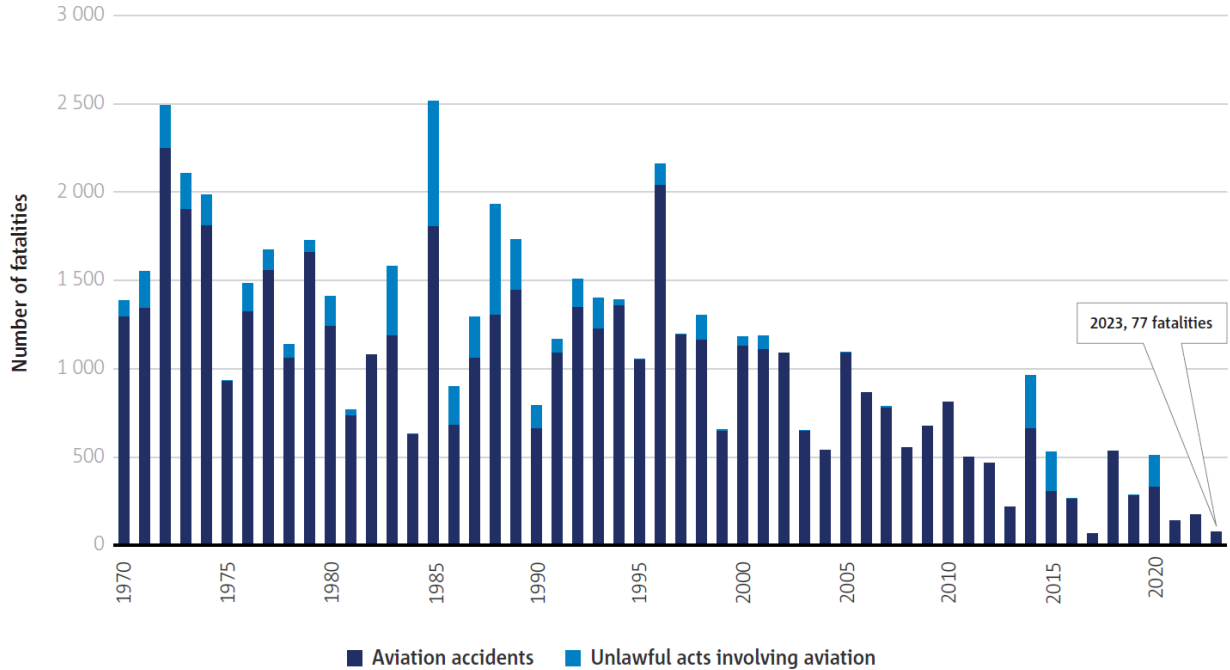
→ Pre-technological concept

- Paper/ fax reporting forms
- Resource hungry to encode, analyse and store
- Difficult to attain consistency at scale



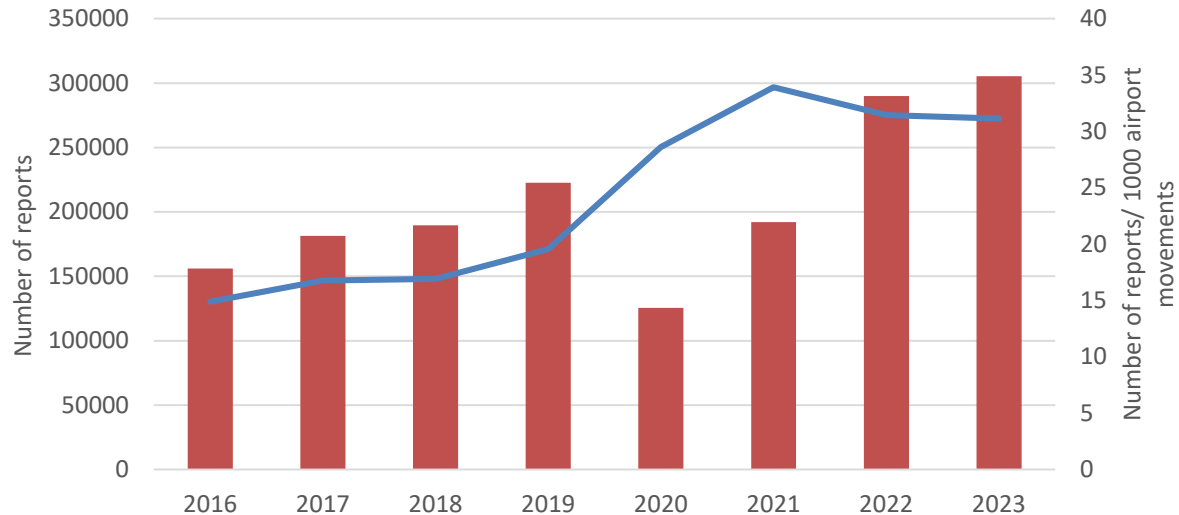
Safety Occurrence Reporting

→ BUT enormously effective and part of the story of how we got from the fatality levels of the 1970s to those of today



Safety Occurrence Reporting

- Part of that story, is going from the reporting rates and activity levels of the 1970s to today
- We gather data on a scale much larger than ever before



Regulation 376/2014 on Occurrence Reporting

- In EASA Member States this increase is partly associated with the introduction of Regulation 376/2014
- Defines:
 - What shall be reported and by whom
 - What shall be recorded in each report
 - Data sharing by the Member States and EASA
 - Protection of reporters and confidentiality of reports
 - Common risk classification by the Member States' Competent Authorities and EASA

Safety Occurrence Reporting

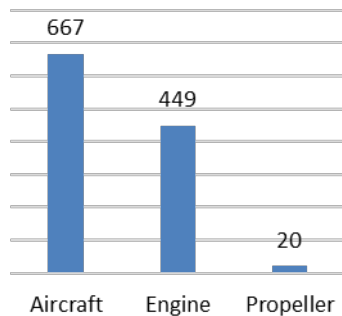
- Reporting doubled in the EASA Member States in 8 years
- But our staffing levels didn't, and they won't
- Difficult for the Member States and also for EASA where it oversees organisations directly
 - Examples: design, production, third-country maintenance organisations, article 65 transfers (AOC, CAMO...)



Safety Data Management

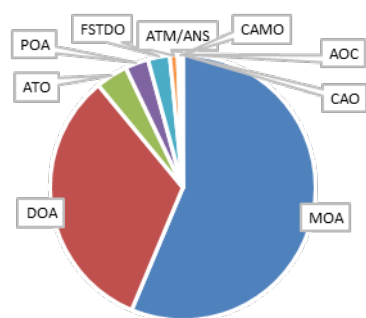
EASA as a Competent Authority

Managing the safety occurrence reports from our organisations and about our products



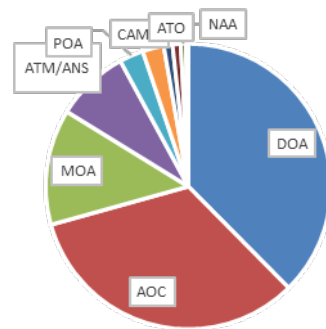
> 1,100

Products registered in SDM



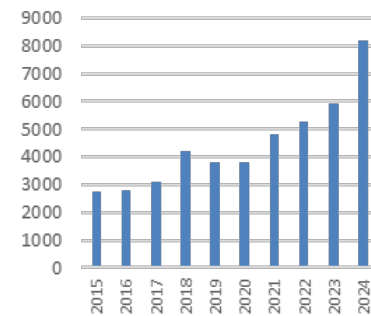
> 2,000

Organisations registered in SDM



18,000

Reports in 2024



45,220

Occurrences contributed to ECR

Normal processing concept

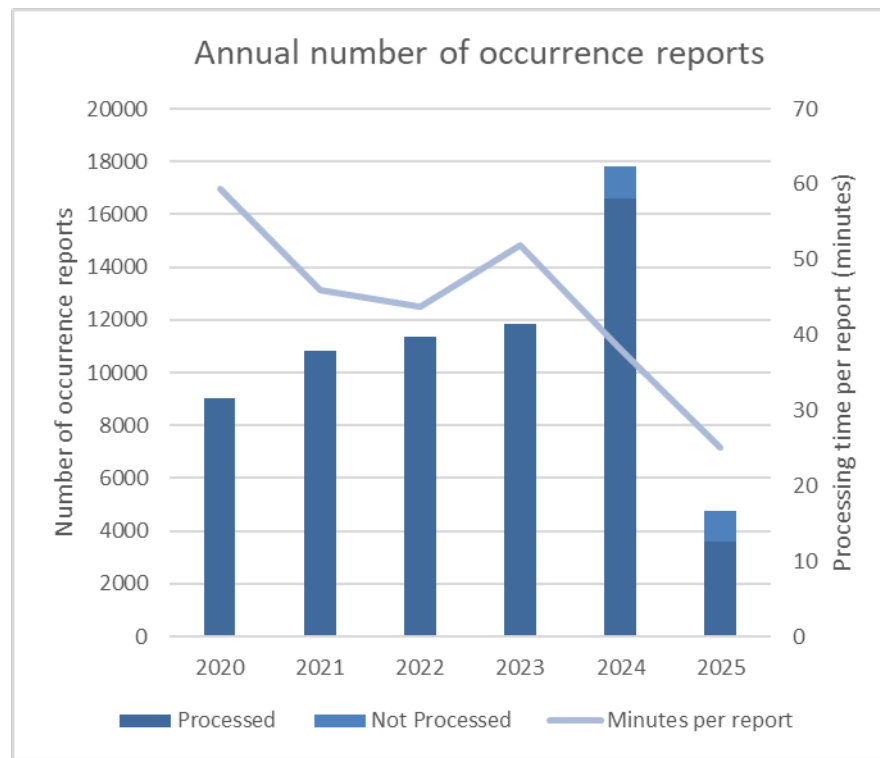


AI Semi-automation of occurrence data encoding

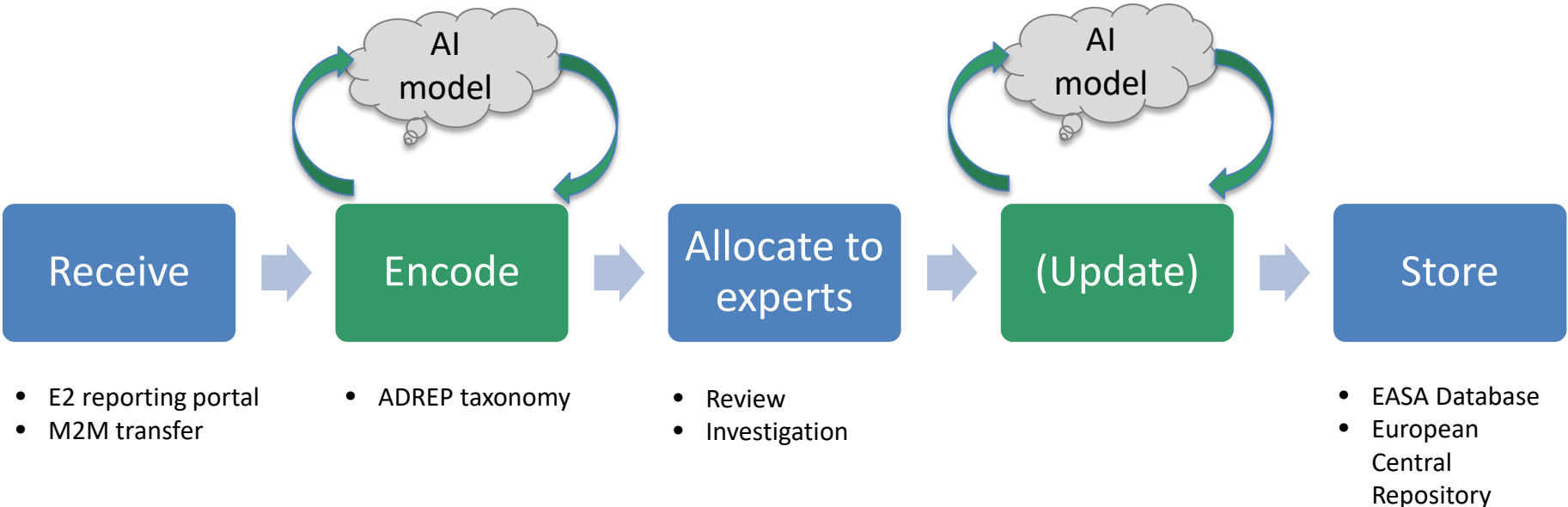
- Reg. 376/2014 requires that Member States apply:
 - Common and specific mandatory data fields (date, aircraft type, event type...)
 - Risk classification using the European Risk Classification Scheme (ERCS)
- Labour intensive and against a backdrop of increasing reporting
- Automation goals
 - **Consistency** – the machine does the same thing every time
 - **Detail** – it does not take more time to add more codes
 - **Time** – allowing the humans in the system to add greater value

Efficiency gains 2024/25 – conventional methods

- New E2 reporting forms based on login credentials
 - Autocompletion of certain details
 - Slimmed down forms based on organisation type
 - Easier for reporters (win-win)
- Additional pre-processing based on simple rules/ logic
- Procedures adapted to prioritise efficiency



AI processing concept

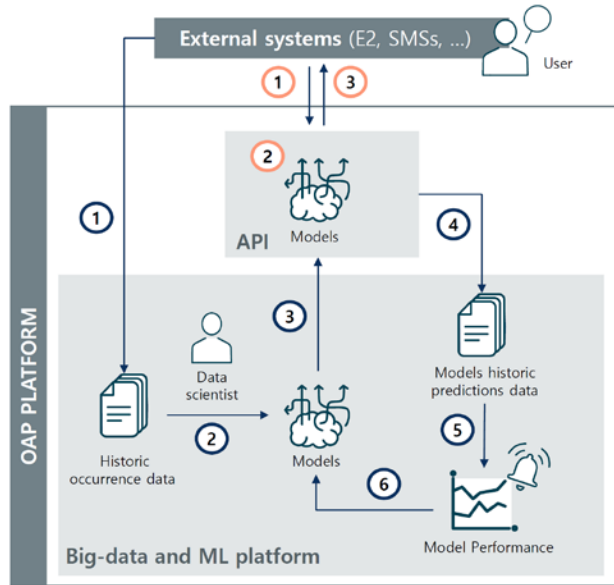


Structure of AI tool and E2

→ Occurrence Automations Platform – Data4Safety

Solution conceptualization

OAP – OAP is a big-data platform that will provide the API for proposal generation and supports model development, monitoring, and retraining



- 1 The user asks for scores proposal through its risk evaluation framework. The risk evaluation framework requests it through the API
- 2 With the data sent by the evaluation framework, the model provides a proposal for the score
- 3 The evaluation framework receives the proposal and displays it back to the user

- 1 Occurrence data is periodically recovered from external systems
- 2 Based on this data, the data-scientists develop models for proposal inference
- 3 Once completed, the model is promoted into production and made accessible through the API
- 4 The requests made to the model and the responses provided are stored in the OAP
- 5 This data is used to monitor the evolution of the performance of the model
- 6 If performance drops, the model is automatically re-trained and re-deployed using the latest occurrences' data

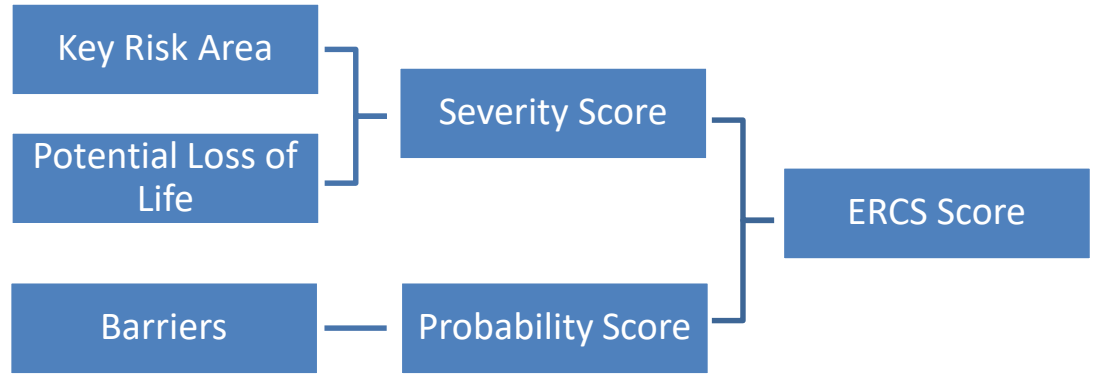
Tools to be developed and timelines

→ Three modules:

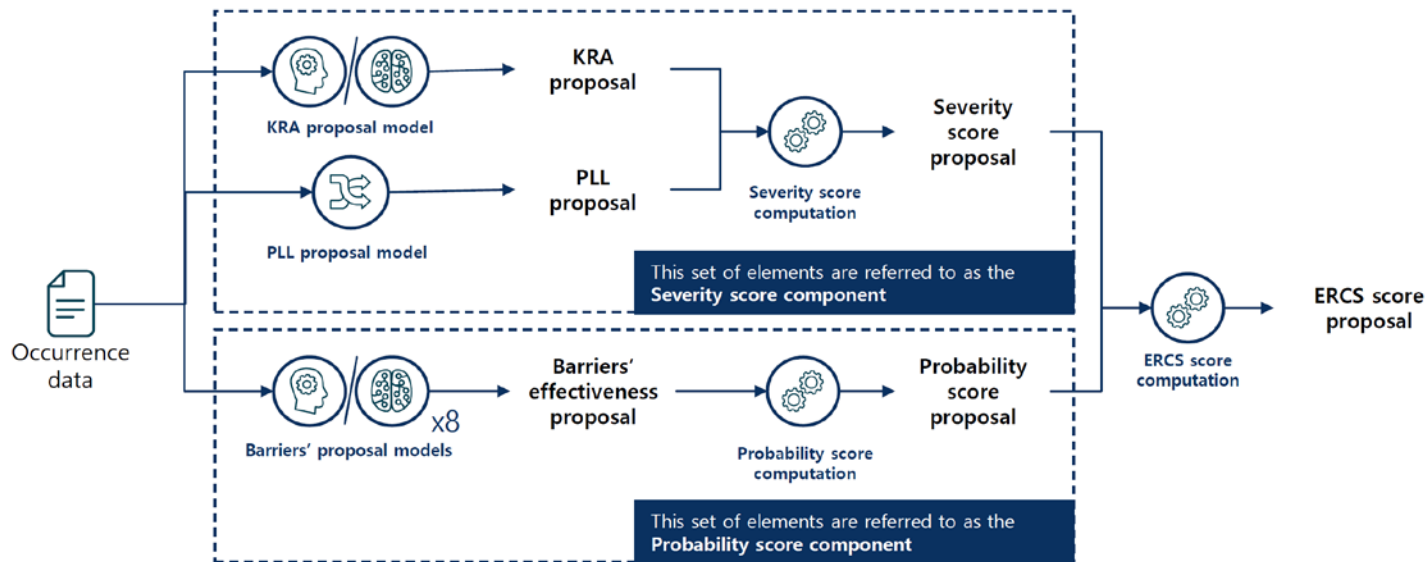
Module A Occurrence information extractor	A1. Topic extraction and summary generation	Q4/2025
	A2. Formatted narrative generator	
	A3. Mandatory fields inference	
	A4. Mandatory aircraft fields	
Module B Occurrence record updating	B.1 Narrative differences highlighter and change proposal	Q4/2025
	B.2 Mandatory fields differences highlighter and change proposal	
Module C European Risk Classification Scheme (ERCS) classification	C1. Proposal of KRA and potential loss of life categories	Q2/2025
	C2. Proposal of barrier category	
	C3. Automatic detection of report type	
	C4. Automatic detection of existing scorings	
	C5. Automatic application of the mappings (RAT, ARMS)	

Reminder – ERCS Methodology

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											



ERCS via semi-automation tool



Expert-knowledge model



Machine Learning model



Master table



Inference logics



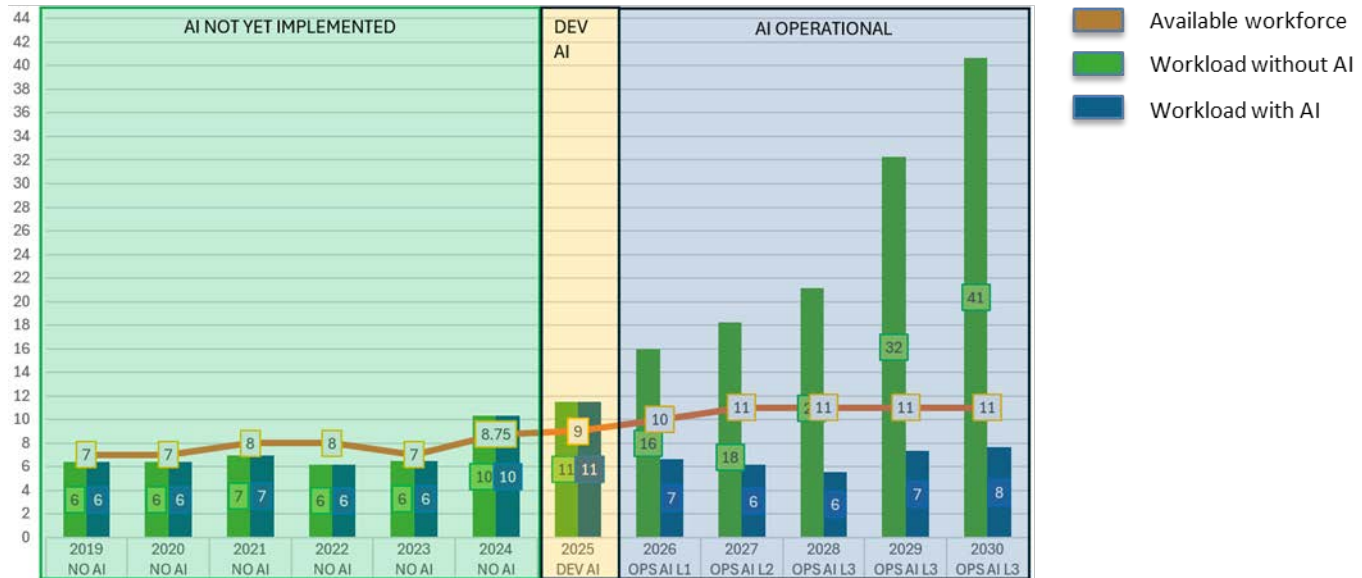
AI tools in other organisations

- Modules A and B to be developed Q3 and Q4 this year
- EASA is not alone in this work, nor even the first
 - Airlines already using similar tools to fulfil their reporting requirements
 - Analytical tools already being used to support safety departments

Forecast efficiency gains – using AI to aid processing

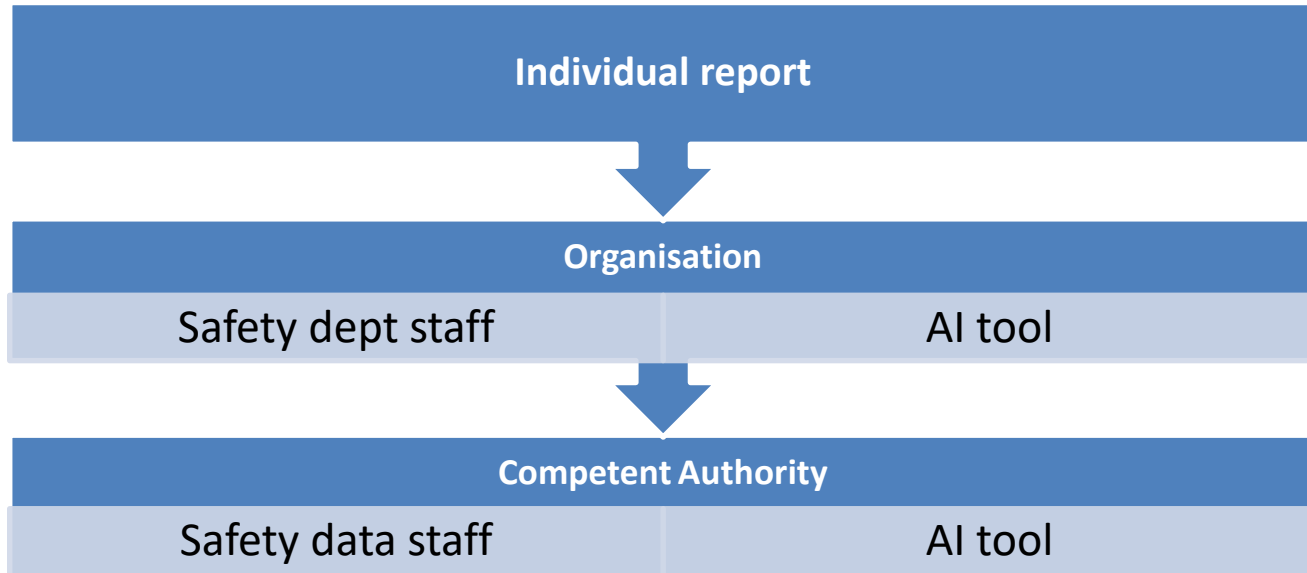
- ➔ Additional funding and use of the Data4Safety Programme is principally to reduce resource-intensive activity

Evolution of the induced workload (FTEs)



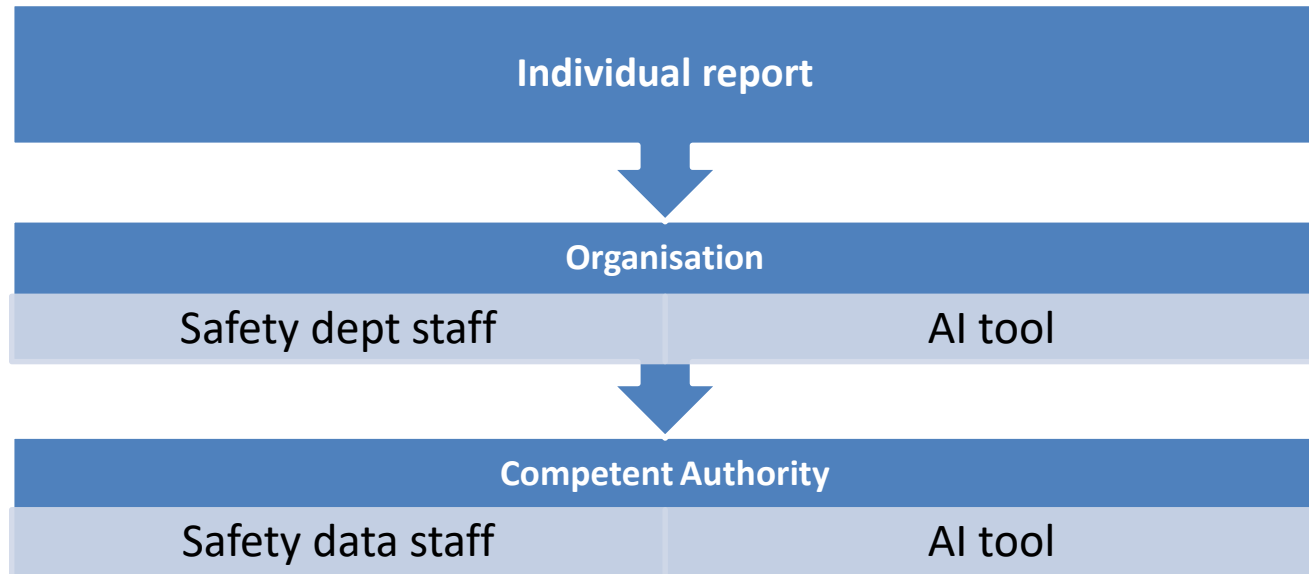
What else should we consider with these tools?

→ At each reporting stage, the version of events may be modified, but by whom?



What else should we consider with these tools?

→ What is the effect of having layers of AI interpreting the report, as compared to layers of safety staff?

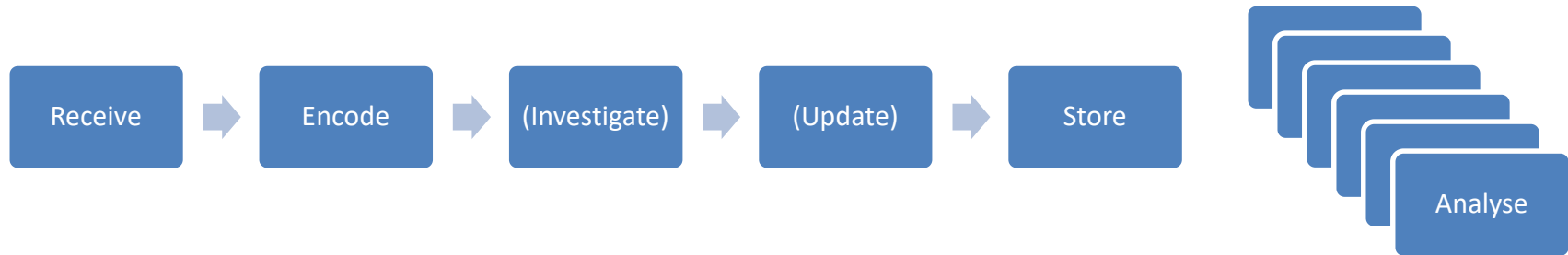


What else should we consider with these tools?

- The tools will likely be more consistent, but will they smooth the data to the extent that important elements are missed?
- Serious accidents are improbable events, either
 - Unusual events/ circumstances
 - Usual events/ circumstances aligning in an unusual way
- The tools will need to be usable both for majority of incidents and also the rarer accidents

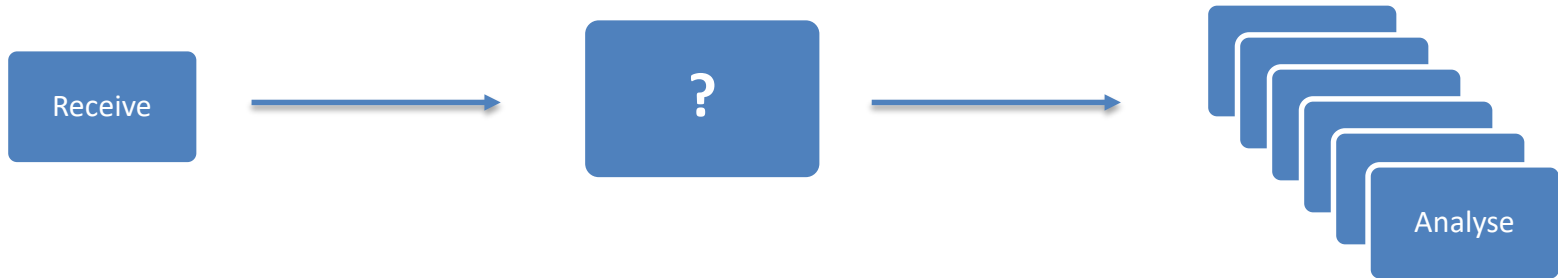
What else should we consider with these tools?

- Applying AI to safety data management is a bit like all the other automations we introduced into aviation
- We are currently replicating the human elements of the process



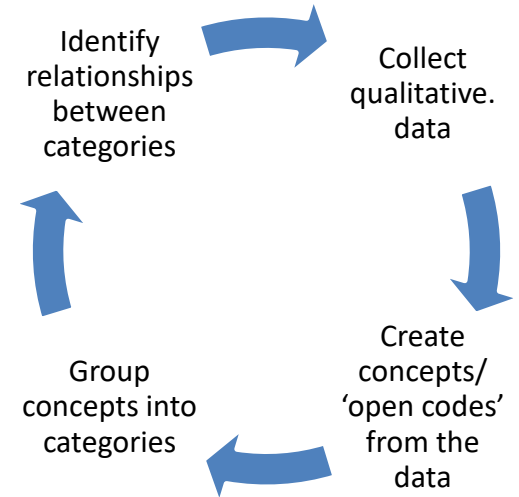
What else should we consider with these tools?

- Applying AI to safety data management is a bit like all the other automations we introduced into aviation
- Could we reconsider the inputs and the outputs, and redesign the interim steps to build a more efficient, effective set of tools?



Safety occurrence data is qualitative

- For example: we could already use AI to support qualitative data analysis
 - MATA vs Thematic analysis
 - Grounded theory
- This would make taxonomies almost obsolete
- Dramatically change the nature of the effort expended on safety data management and analysis



Preparing for the future

- As aviation grows, so too does the number of safety occurrence reports
- Rather than continuing to try to cope, we need a step-change in how we manage this safety data
- Artificial intelligence provides the tools we need to imitate and accelerate our existing processes

Preparing for the future

- We need to test these tools thoroughly, and understand the effects of using them together
- And we need to think bigger, about the broader potential and what this means for:
 - Our staff competences
 - Our process design
 - The regulations underpinning this activity

Questions?

easa.europa.eu/connect



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