

Safety Indicators, Targets, What Methods & Tools

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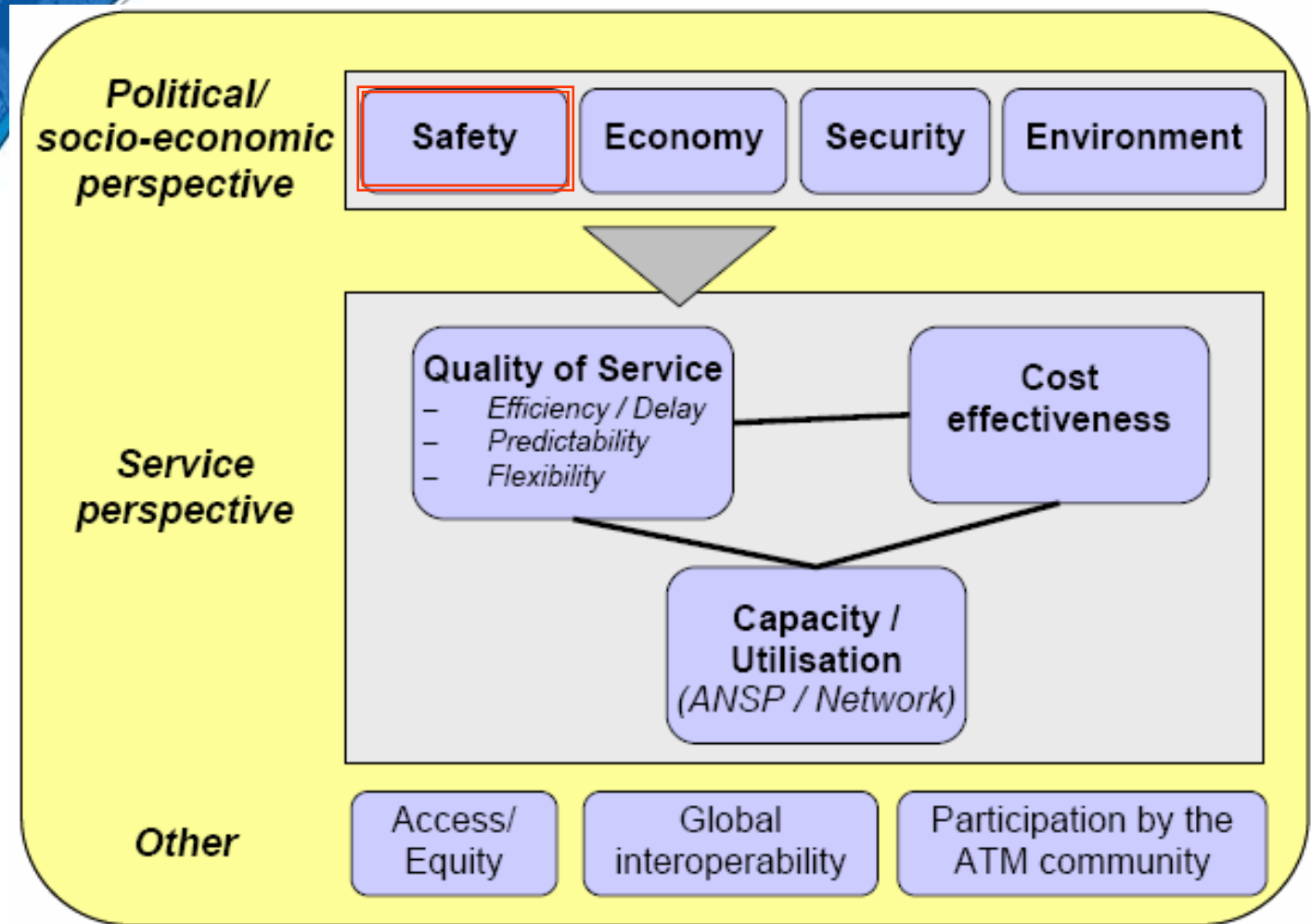


Contents

- SAFREP TF
- The Roadmap
- Safety KPIs background
- Leading Indicators
- Lagging Indicators
- Examples
- Tools and methods



EC Mandate on Performance Measurement



SAFREP TF Safety KPIs principles of development

- (1) ICAO Consistency
- (2) Roles and Responsibilities
- (3) Safety Improvement
- (4) Systemic approach
- (5) Practical Interface
- (6) Trust
- (7) Confidentiality
- (8) Consensus
- (9) Planning the details
- (10) Transparency and progress reporting to decision makers



Stakeholder Requirements

Key Principles

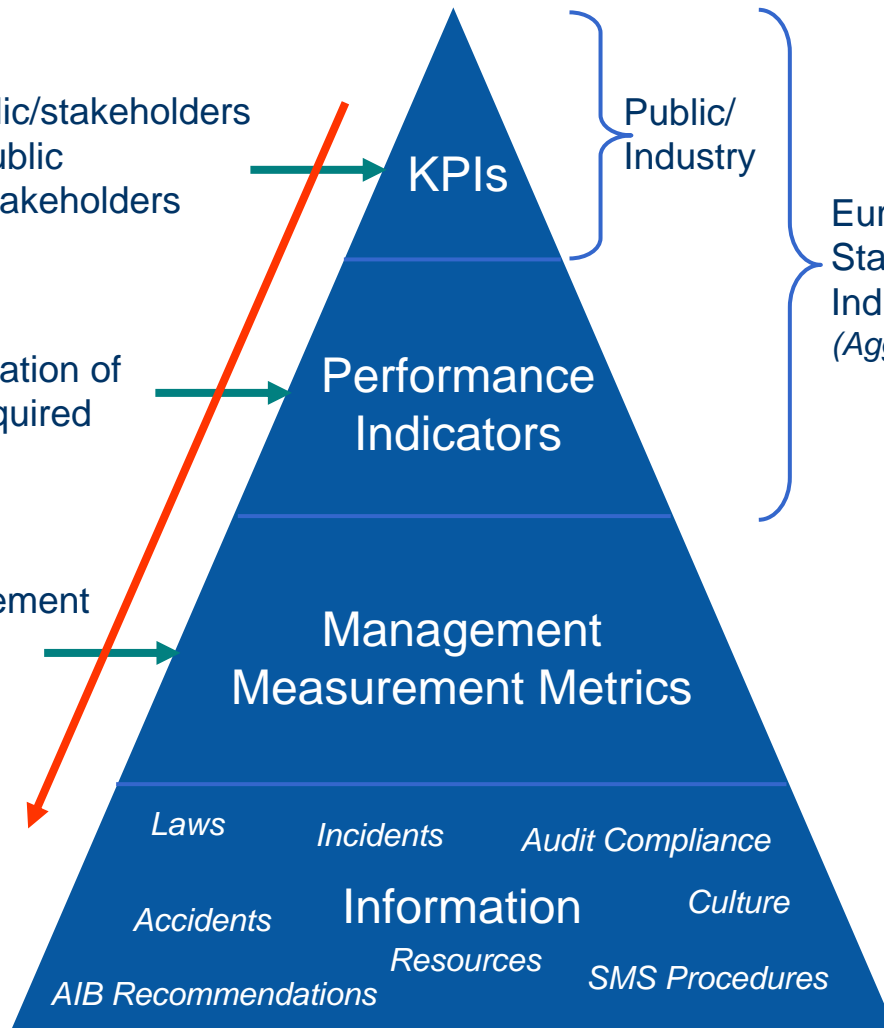
Interested Parties

- Information to public/stakeholders
- Reassurance to public
- Call to action by stakeholders

- Facilitates identification of scope of action required

- Facilitates management of improvement of service

- Increasing level of details



KPIs

Public/
Industry

Performance
Indicators

European/
States/
Industry
(Aggregation of ANSP/States)

Management
Measurement Metrics

Laws

Incidents

Audit Compliance

Accidents

Information

Culture

Resources

SMS Procedures

AIB Recommendations

Principles
why
what

Roles &
Resp.
Who
why



The whole process needs to be a continuous improvement activity

Types of Safety Indicators

- Systematic safety monitoring processes should evaluate, as a matter of routine, achieved safety performance in all safety-related operational activities.
- Safety performance indicators are used to analyse trends and detect unwanted degradation of safety levels, supporting the development of effective improvement plans.
- They can also be used to assess the extent to which political, strategic, regulatory and industry safety targets are being met.
- In addition to measuring the core safety task, a measurement system that can incorporate error tolerance, reaction and recovery level will be explored.



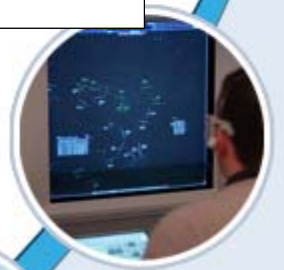
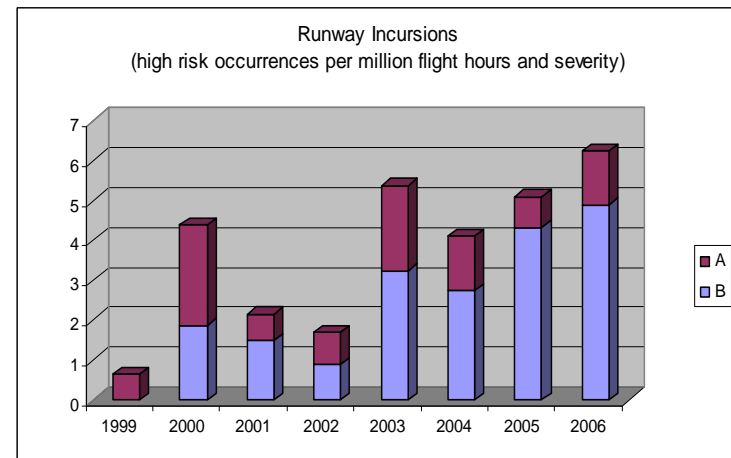
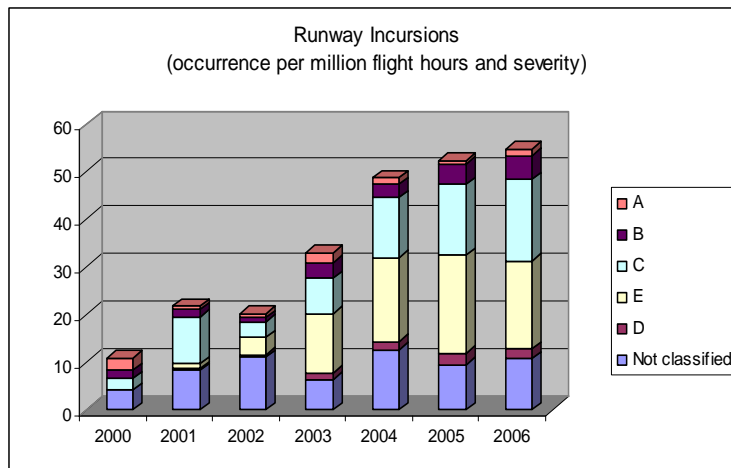
Lagging indicators

Indicators which

- measure events (e.g. safety occurrences, such as accidents, incidents, system outages etc.) that have happened
- measure whether safety improvement activities have been effective in mitigating identified risk
- measure the outcome of the service delivery
- represent the consequences of actions previously taken
- frequently focus on results at the end a time period and characterize historical performance (e.g. the end of the supply chain i.e. ATM service provision)



Lagging indicators - samples



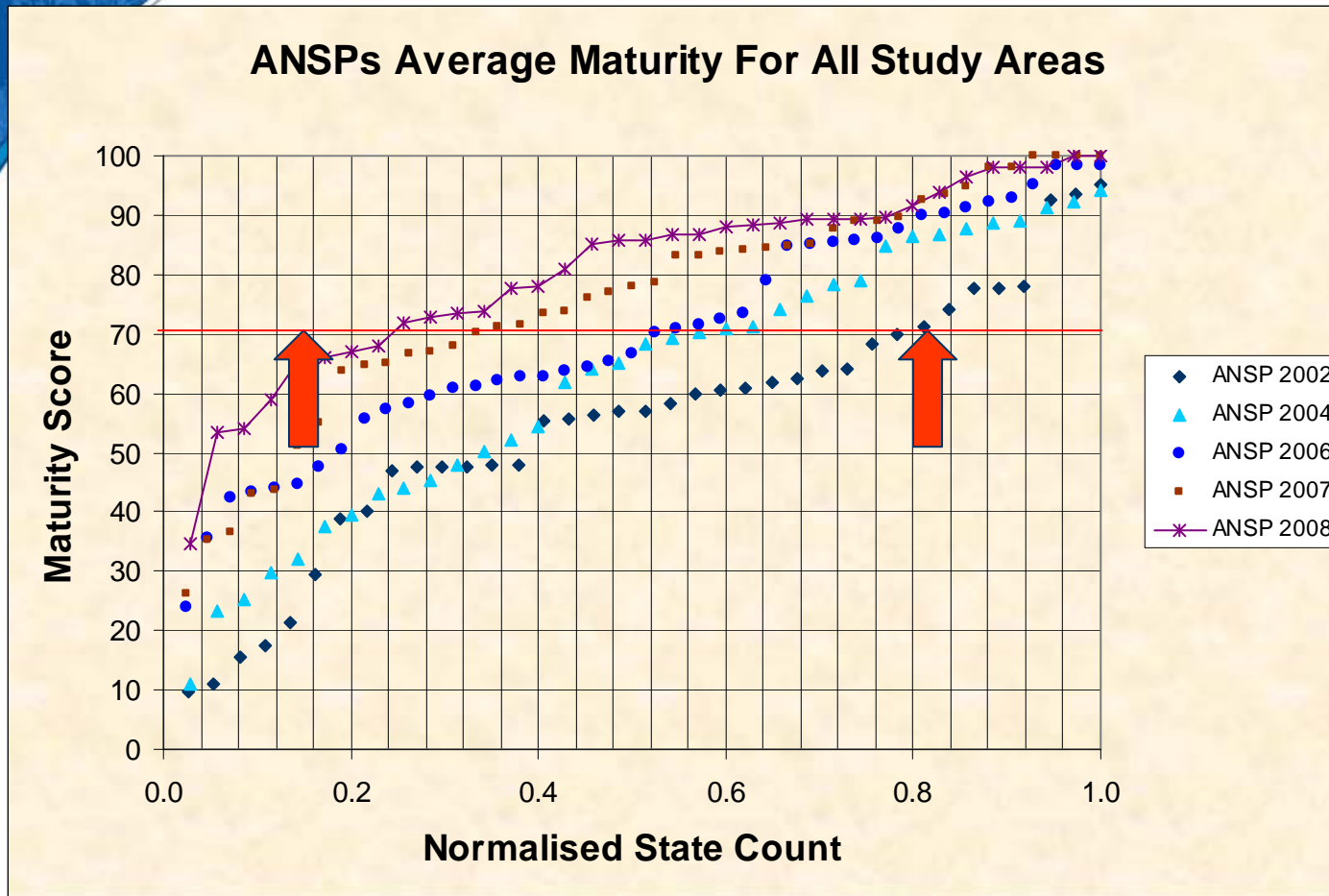
Leading indicators,

Indicators which

- are identified principally through the comprehensive analysis of the organisations (providers, regulators, States)
- are designed to help identify whether the providers and regulators are taking actions or have processes that are effective in lowering the risk
- are considered the "drivers" of **lagging indicators**. There is an assumed relationship between the two, which suggests that improved performance in a **leading indicator** will drive better performance in the **lagging indicator**. Improved rules, regulations, oversight, procedures etc will lead hopefully to fewer errors within various layers of organisation and hence to less safety occurrences



Sample of Leading indicators

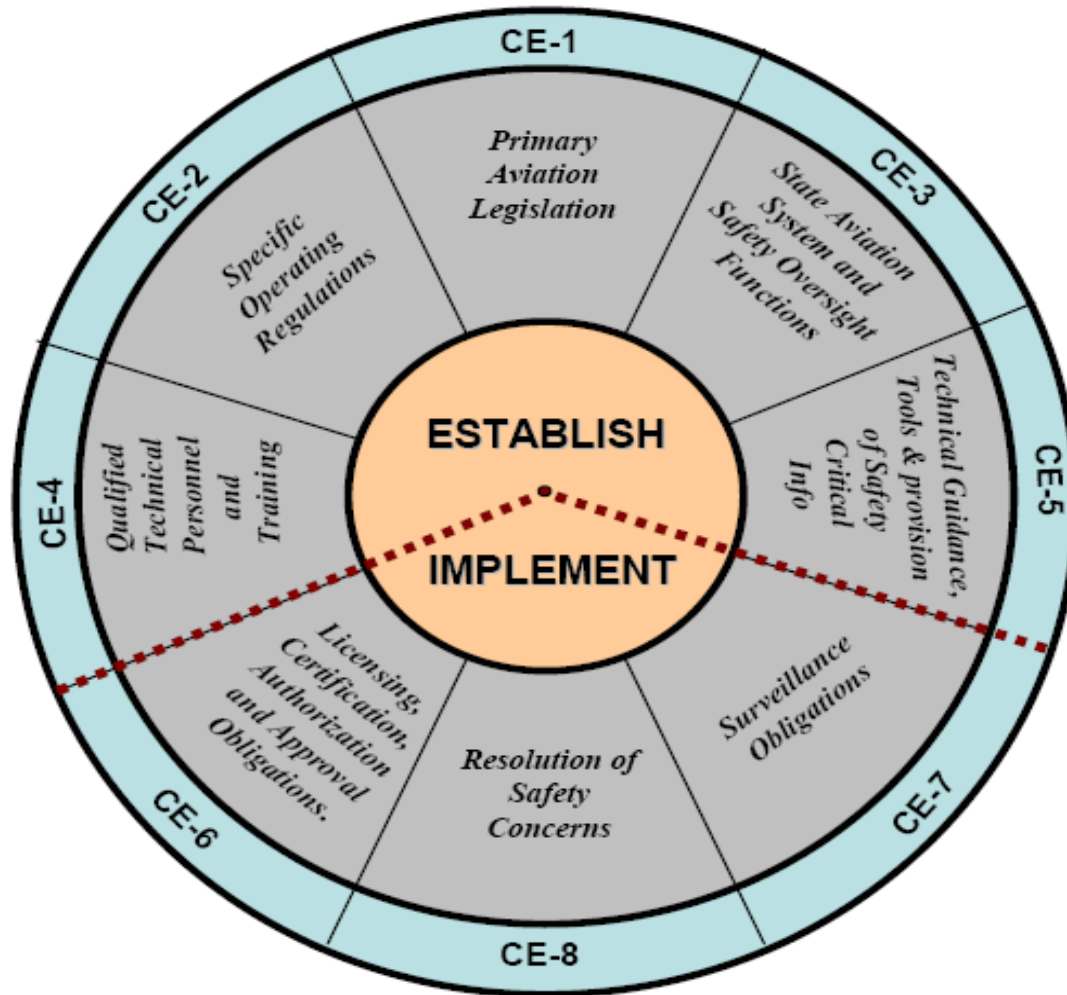


Sample of Leading Indicators – for REGULATORS

Level of Implementation of the Critical Elements of a Safety Oversight System										
CRITICAL ELEMENT	1 = Not Implemented									
	10 = Fully Implemented									
	■ = State's Level of Implementation									
	□ = ECAC Average									
	1	2	3	4	5	6	7	8	9	10
Primary Aviation Legislation	□	□	□	□	□	□	□	□	■	□
Specific Operating Regulations	□	□	□	□	□	□	□	□	□	■
State Civil Aviation System and Safety Oversight Functions	□	□	□	□	□	□	□	□	□	■
Technical Personnel Qualification and Training	□	□	□	□	□	□	□	□	□	■
Technical Guidance, Tools and the Provision of Safety-Critical Information	□	□	□	□	□	□	□	■	□	□
Licensing, Certification, Authorisation and Approval Obligations	□	□	□	□	□	□	□	□	□	■
Surveillance Obligations	□	□	□	□	□	□	□	■	□	□
Resolution of Safety Concerns	□	□	□	□	□	□	□	□	□	■



Sample of Leading Indicators – for REGULATORS



Safety Targets

- Safety targets are derived to meet either political, strategic, regulatory, industry safety objectives or management performance-driven improvements.
- A cautious approach in setting targets is recommended.
- If targets are set too early in the process, or if they are unduly correlated with other performance indicators (such as efficiency or pay), the whole process may be threatened.
- The starting point for setting targets should be **leading indicators** and subsequently with improved maturity of the system the targets for **lagging indicators**



Tools and Methods

- TAXONOMY (HEIDI/ADREP)
- TOKAI (TOOl Kit for ATM Occurrence Reporting)
- Severity and risk of recurrence principles (EAM2-GUI5) and its related TOKAI tool
- SOAM – Systemic Occurrence Analysis Methodology – Causal Factors & Safety recommendations (EAM2-GUI8) TOKAI future tool
- Safety metrics, statistical tool & analysis of safety trends – TOKAI tools
- ASMT/InCAS
- Safety Maturity Questionnaire – What If tool – RADAR diagram analysis*
- Safety Surveys Technique (EUROCONTROL/ ICAO/Transport Canada)
- Overall SMS principles and metrics in EGSMM*



TAXONOMY

HEIDI

TOKAI - Create Occurrence From Existing Reporting Form

File Database TOKAI Tools Window Help

Data Gathering - Importing ATS Occurrence Reporting File

Background

Find Find Next

Background

- Background data
- Short summary description of the occurrence
- Type of report
- Type of form/report
- National incident ref. Number
- State reporting
- Number of cross ref. reports
- Date of occurrence
- Time of occurrence (Local Time)
- Time of occurrence (UTC)
- Location of occurrence
- Number of ATS units involved and name
- Injury index (occurrence)
- Type of system alert
- Data related to ANS Service
- Data related to Aircraft /Vehicle/Persons/Anim
- Meteorological conditions

Validate

Clear Input

Help

Name	Value
National Reference Number:	REP0002
1. Date of Occurrence (UTC):	12 02 1999
Time of Occurrence (UTC):	15:40
2. Day or Night:	Day
Geographical location of occurrence (longitude/other):	
4. Number of aircraft involved:	2
Aircraft No 1	
Operator:	AFR
Call sign and/or registration:	F-GJVG

Collapse button

Inputs made in ATS Occurrence

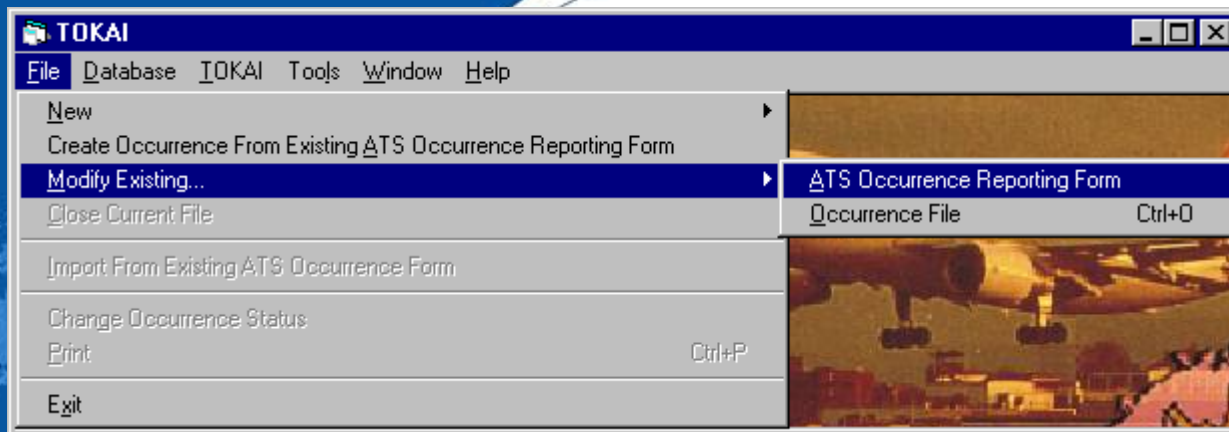
EUROCONTROL

EUROPEAN
AIR
TRAFFIC
MANAGEMENT
PROGRAMME

EATMP

HEIDI TAXONOMY

TOKAI



TOKAI - ATS Reporting Form: REP0003

File Database TOKAI Tools Window Help

TOKAI - ATS OCCURENCE REPORTING FORM

ATS Occurrence Reporting Form

National Reference Number: REP0003

OK Cancel Print

Main Data, Box 1-12 Other Data, Box 14-19 Description of Occurrence, Box 13

1. Date and Time of Occurrence (UTC):
 DATE: Day DD Month MM Year YYYY
 TIME (as HH:MM) HH:MM

2. Day/Night
☐ Day
☐ Night

3. Geographical location of occurrence:
 Latitude/other
 Longitude/other

4. Aircraft Involved
☐ Yes
☐ No

5. RTF frequency and surveillance equipment used:

6. Class of Airspace
☐ A ☐ E
☐ B ☐ F
☐ C ☐ G
☐ D

7. Type of Air Traffic Service:

8. Estimated Horizontal / Vertical Distance
 Vertical Distance: ☐ feet ☐ m
 Horizontal Distance: ☐ NM ☐ km ☐ min

9. Automated Warning System
 Ground-based: ☐ STCA ☐ MSAW ☐ APW ☐ SMF ☐ Other
 Airborne: ☐ GPWS ☐ ACAS ☐ Other

10. Traffic Information Given
☐ Yes
☐ No

11. Recordings reviewed?
☐ Yes
☐ No

12. Weather
☐ Yes
☐ No

A/c Details

Operator:

Call sign and/or registration:

Type:

ADEP: Support...

ADES: Support...

OK Cancel Help

FL / Altitude / Height

FL Actual Cleared
☒ feet ☐ m

Altitude Actual Cleared
☒ feet ☐ m

Height Actual Cleared
☒ feet ☐ m

SSR Code:

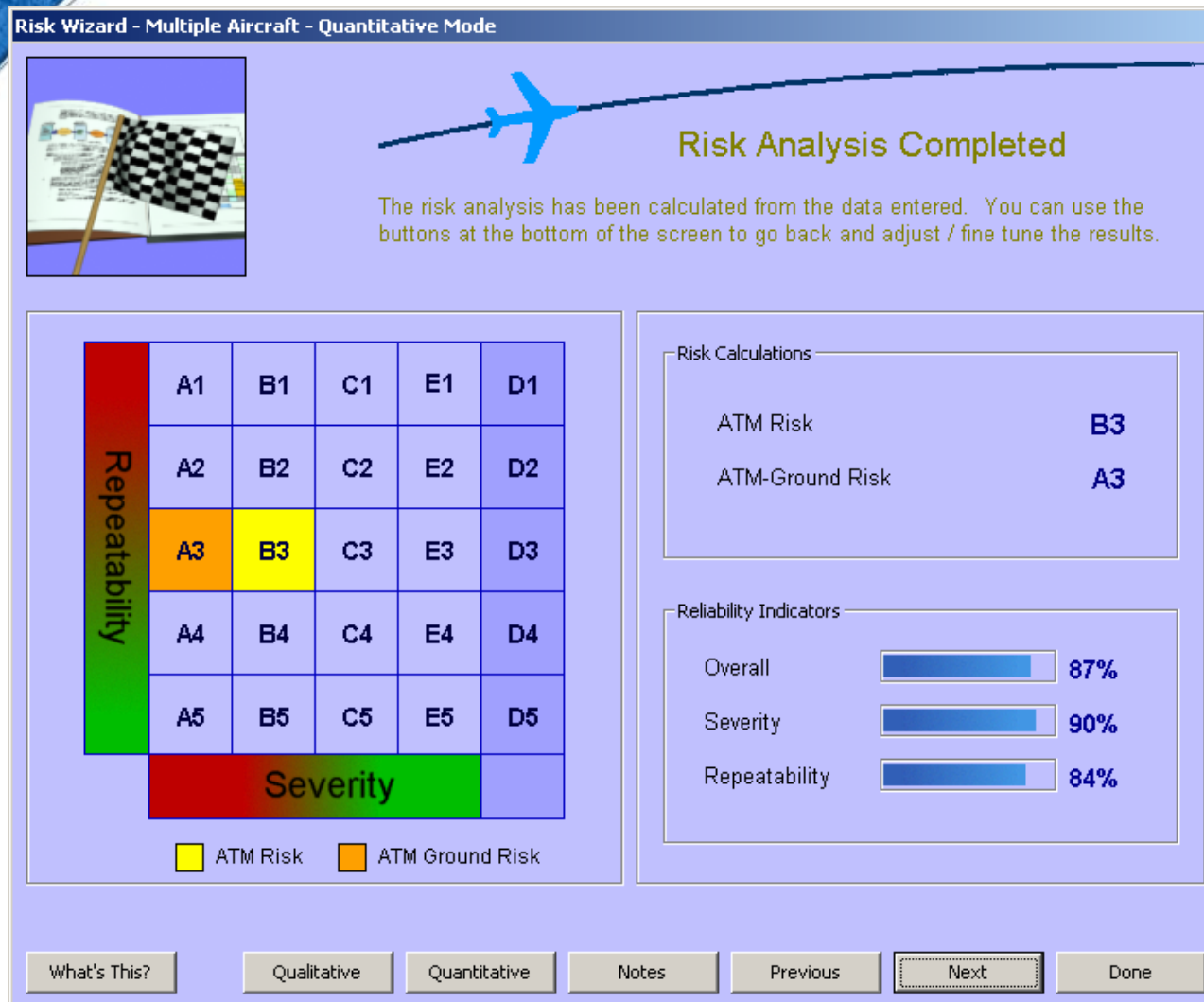
Mode C: ☐ Yes ☐ No

Relevant route segment:

Flight Rules
☐ IFR ☐ SVFR ☐ IFR / VFR ☐ Unknown
☐ VFR ☐ CVFR ☐ VFR / IFR ☐ Other

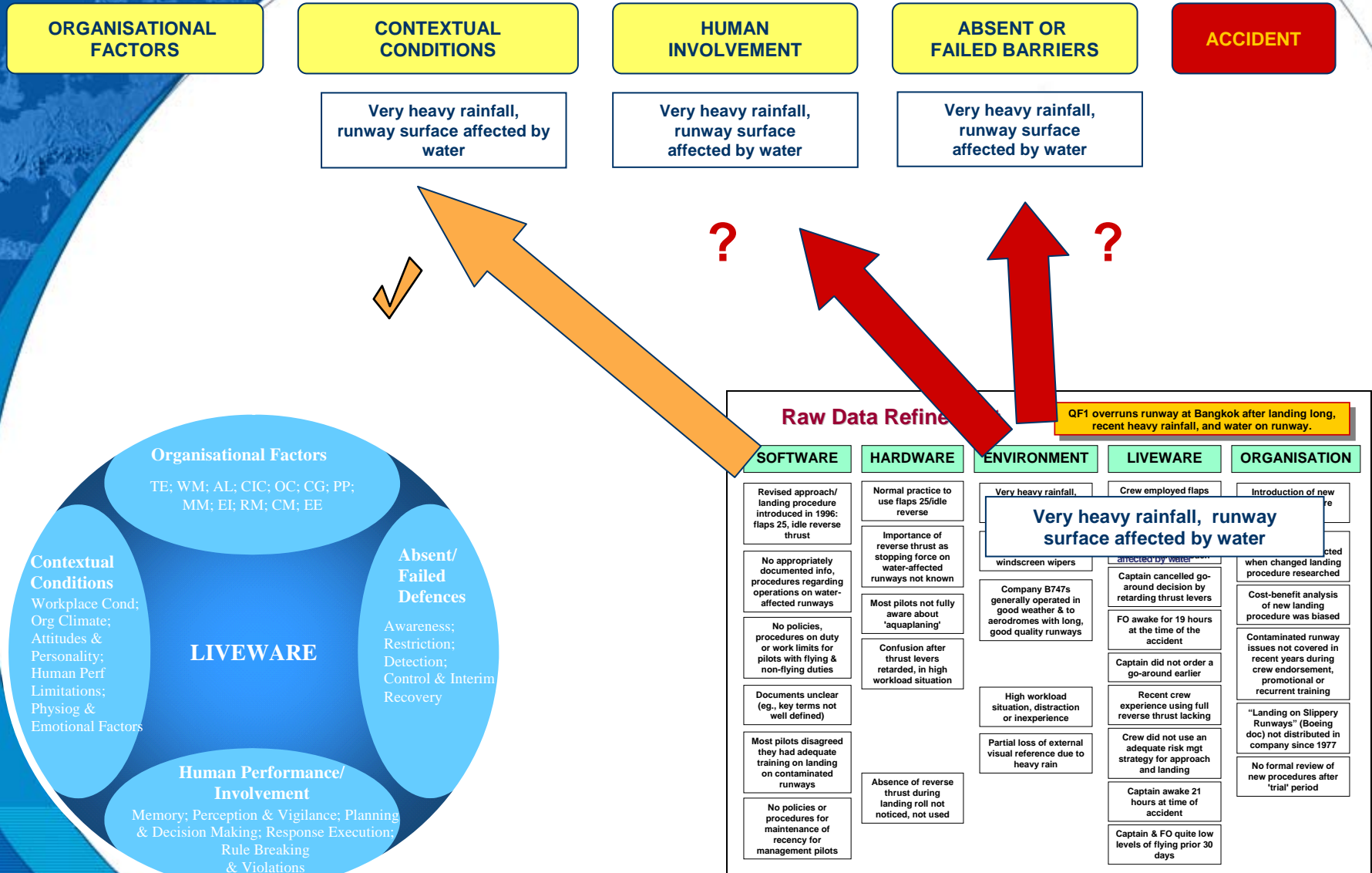


Severity and risk of recurrence principles (EAM2-GUI5) and its related TOKAI tool

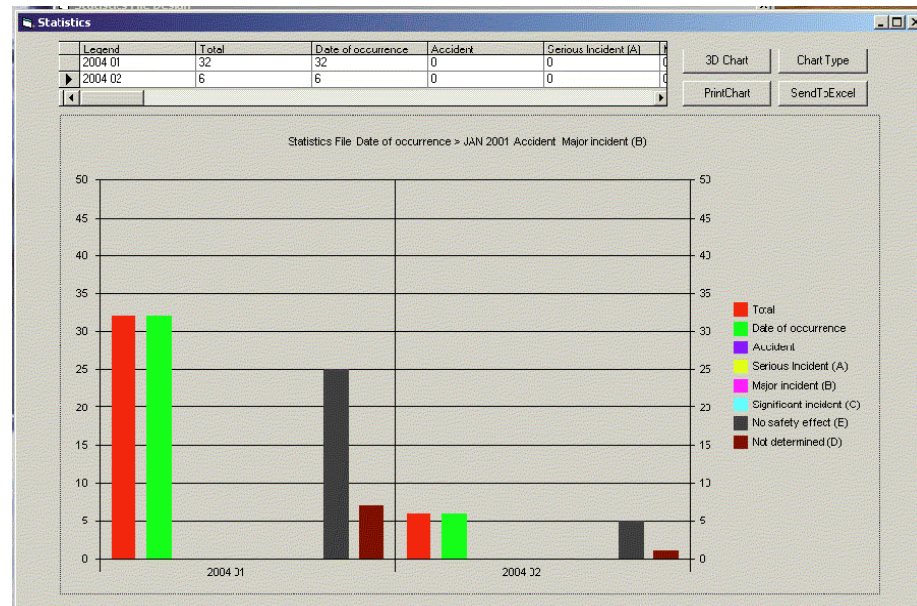


SOAM – Systemic Occurrence Analysis Methodology

EAM2-GUI8



Safety metrics, statistical tool & analysis of safety trends – TOKAI tools



Statistics File Design

Name: Statistics File

Sections:

- Name
- Near collision
- Severity
- Frequency
- collision
- ACAS
- OccsByAircraftNumber
- NumberOfAircraftInvolved
- Noact
- Severity2
- Severity

Elements:

- Date of occurrence
- Accident
- Serious Incident (A)
- Major incident (B)
- Significant incident (C)
- No safety effect (E)
- Not determined (D)

Run Saved
Run All Saved
Set Conditions

Applicable Rule

Rule: FIFO, Display Value

DD.MM.YYYY

Statistics

Term	option	Value	Nam
<input checked="" type="checkbox"/> Date of occurrence	DD.MM....	> JAN 2001	
<input checked="" type="checkbox"/> Accident	Y/N		
<input type="checkbox"/> Serious Incident (A)	Y/N		
<input checked="" type="checkbox"/> Major incident (B)	Y/N		

View View All



ASMT

Simulator

ACC

RADAR

AIR SITUATION

Tracks

Radar Data OR
External Events

Flight Plans

User Site

ASMT

Safety
Event
Detection

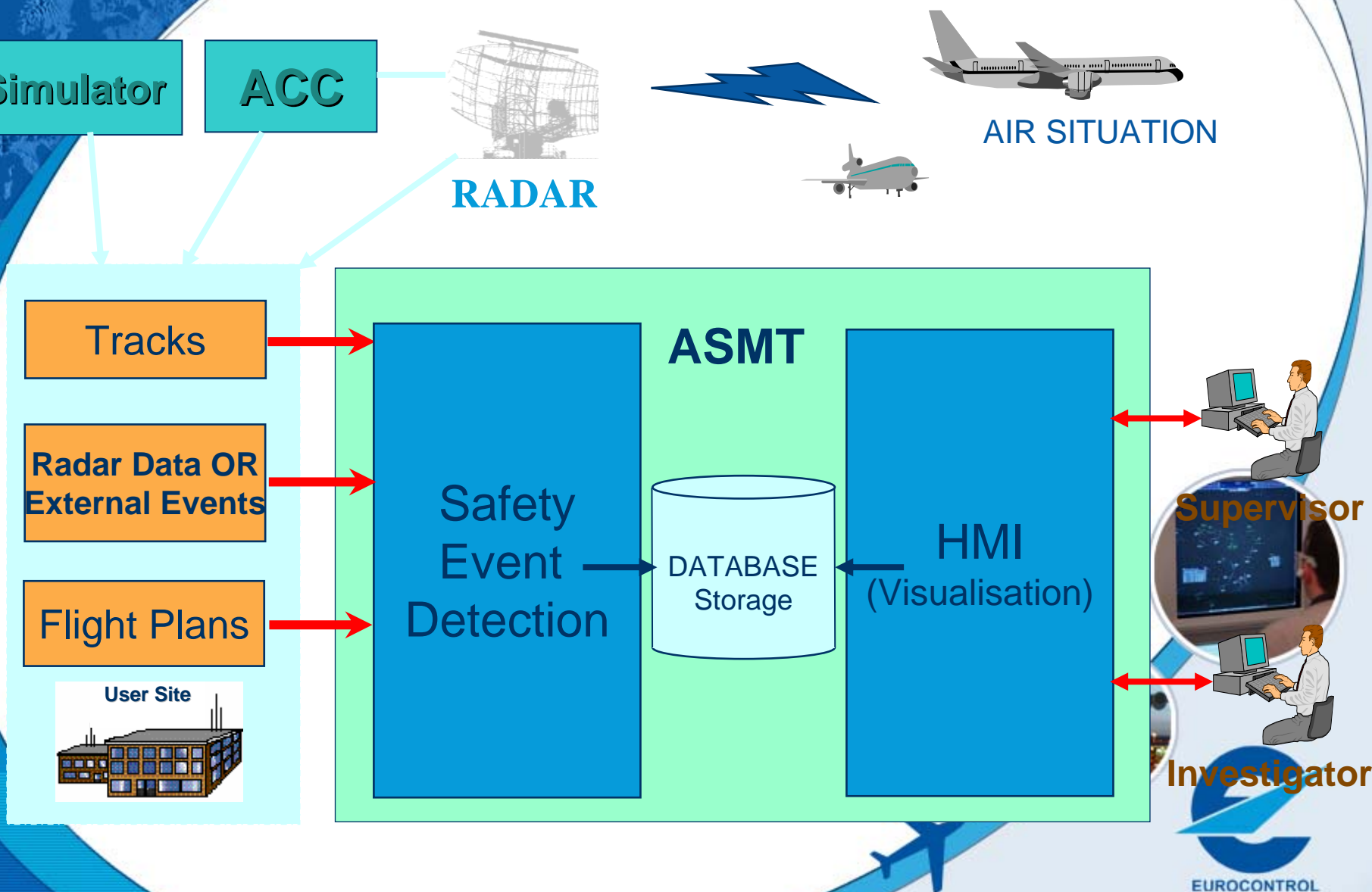
DATABASE
Storage

HMI
(Visualisation)

Supervisor

Investigator

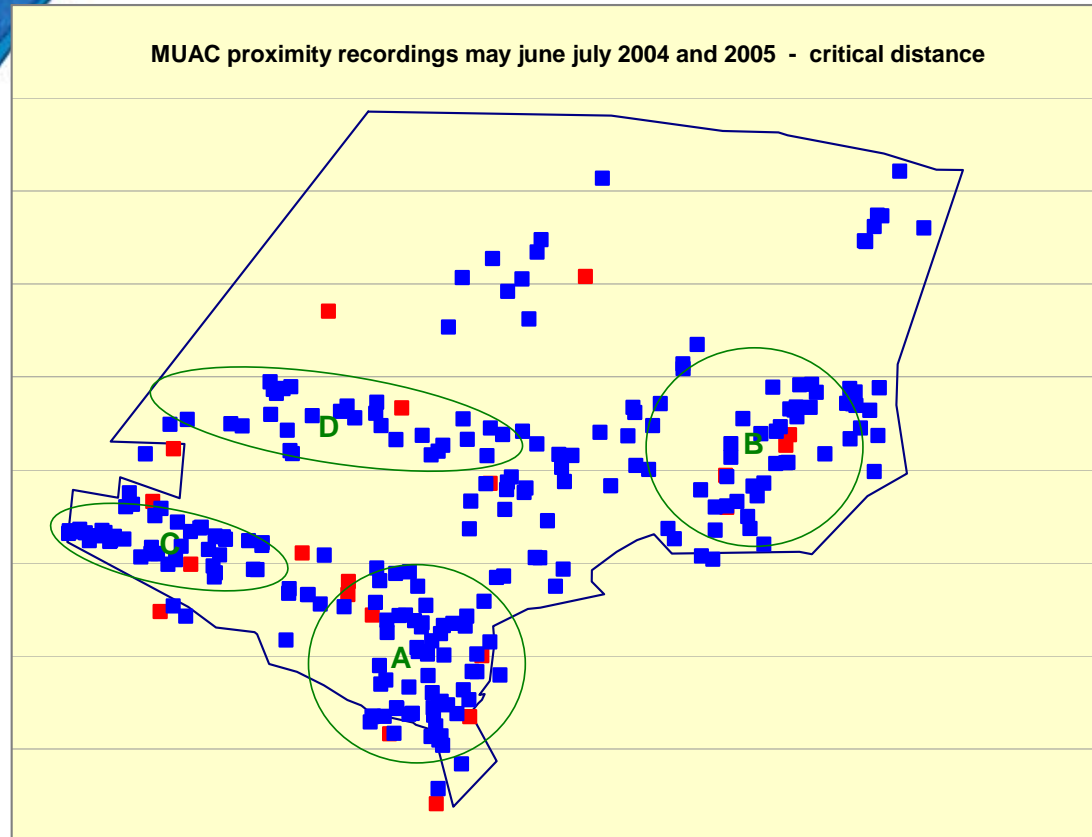
EUROCONTROL



Hot Spot Analyses

Critical distance recordings

between 0-2NM / 0-600ft
between 2.1-4NM / 0-400ft

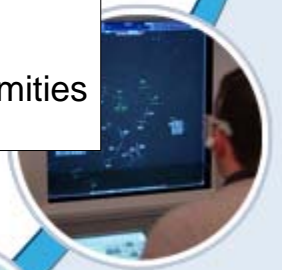


— map

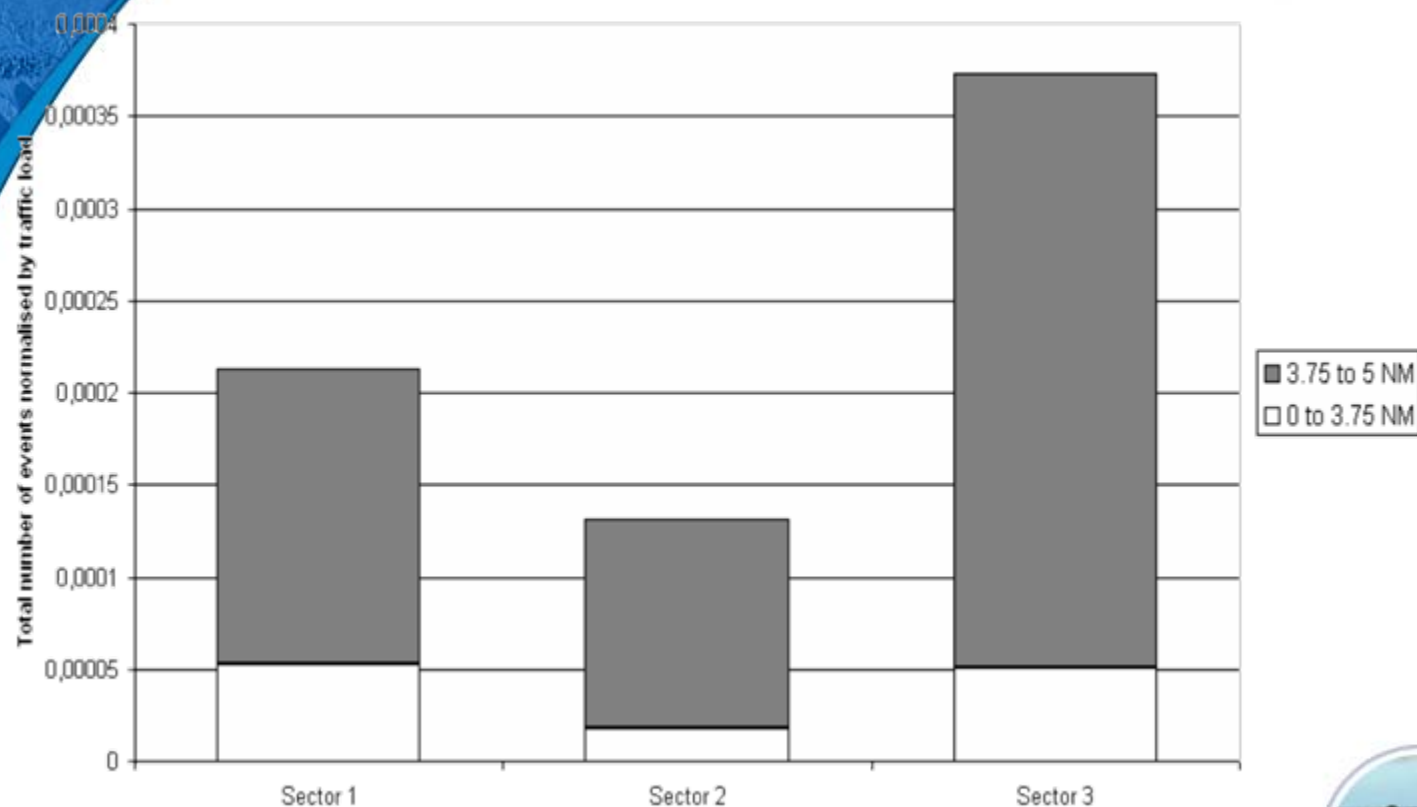
■ critical distance

■ other proximities

- Critical distance recordings do not show a hot spot
⇒ criterion not relevant for hot spot analyses



Analyze a wider set of occurrences

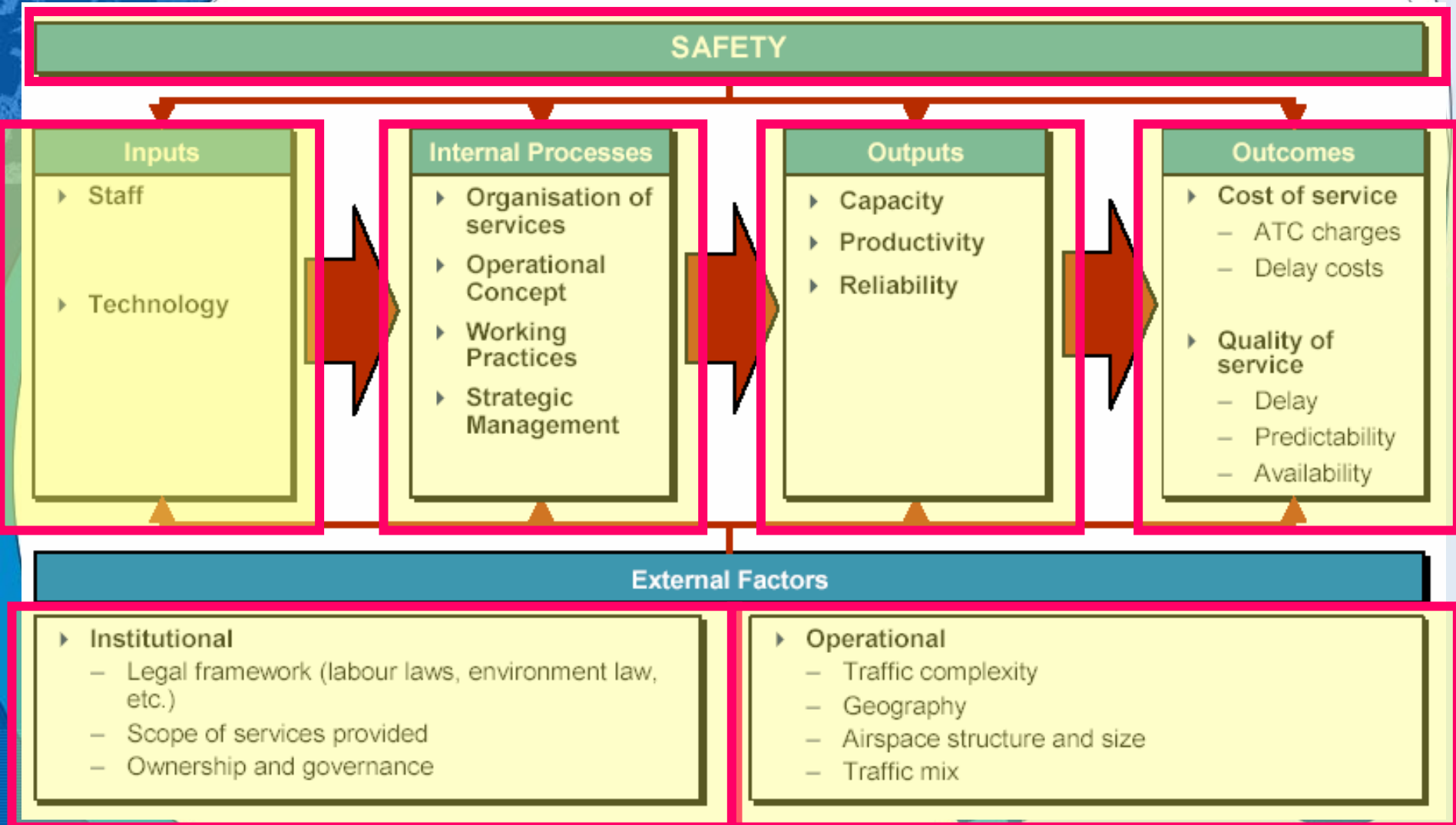


White part: high probability for manual reporting

Grey part: low probability for manual reporting

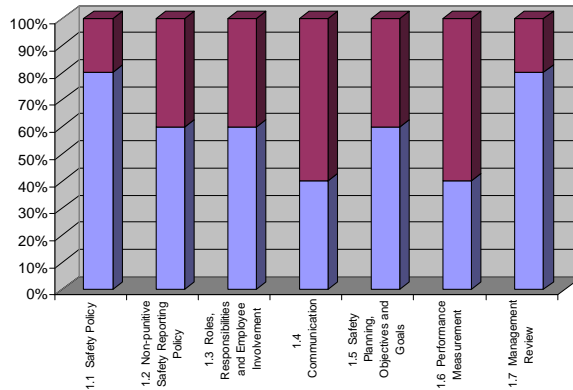


Safety Surveys Technique (EUROCONTROL/ ICAO/Transport Canada)

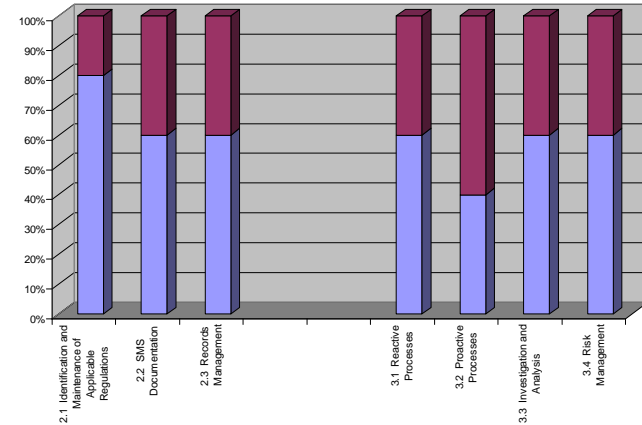


Safety Surveys Technique (EUROCONTROL/ ICAO/Transport Canada)

Safety Management Plan Scoring



Documentation & Oversight Scoring



ELEMENT	ESARR Compliant	ELEMENT SCORE	Component Score
1.1 Safety Policy	Y / N	4	60%
1.2 Non-punitive Safety Reporting Policy	Y / N	3	
1.3 Roles, Responsibilities and Employee Involvement	Y / N	3	
1.4 Communication	Y / N	2	
1.5 Safety Planning, Objectives and Goals	Y / N	3	
1.6 Performance Measurement	Y / N	2	
1.7 Management Review	Y / N	4	
Total:		21 / 35	60%
2.1 Identification and Maintenance of Applicable Regulations	Y / N	4	67%
2.2 SMS Documentation	Y / N	3	
2.3 Records Management	Y / N	3	
Total:		10 / 15	67%
3.1 Reactive Processes	Y / N	3	55%
3.2 Proactive Processes	Y / N	2	
3.3 Investigation and Analysis	Y / N	3	
3.4 Risk Management	Y / N	3	
Total:		11/20	55%
4.1 Training, Awareness and Competence	Y / N	4	80%
Total:		4/5	
5.1 Operational Quality Assurance*	Y / N	3	60%
Total:		3/5	
6.1 Emergency Preparedness and Response	Y / N	3	60%
Total:		3/5	
Component Score Total:			
Overall SMS Score (Component Score Total / # of Components):			52/85 62%



Stakeholder Requirements

Key Principles

Interested Parties

- Information to public/stakeholders
- Reassurance to public
- Call to action by stakeholders

KPIs

Public/
Industry

European/
States/
Industry
(Aggregation of ANSP/States)

Principles
why
what

- Facilitates identification of scope of action required

Performance
Indicators

- Facilitates management of improvement of service

Management
Measurement Metrics

- Increasing level of details

Laws

Incidents

Audit Compliance

Accidents

Information

Culture

Resources

AIB Recommendations

SMS Procedures

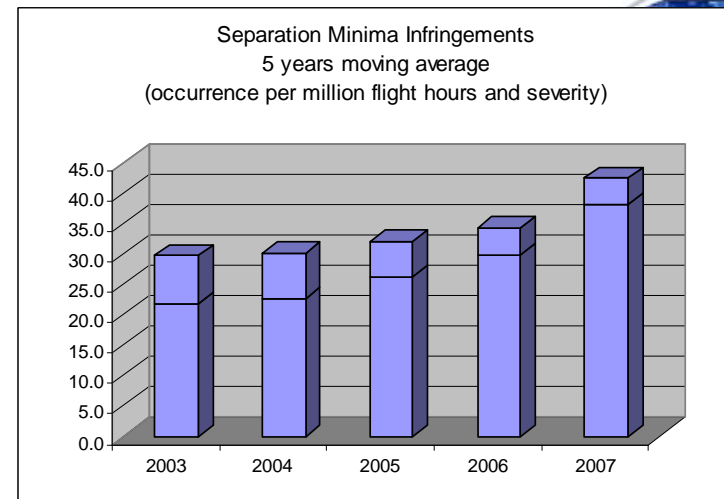
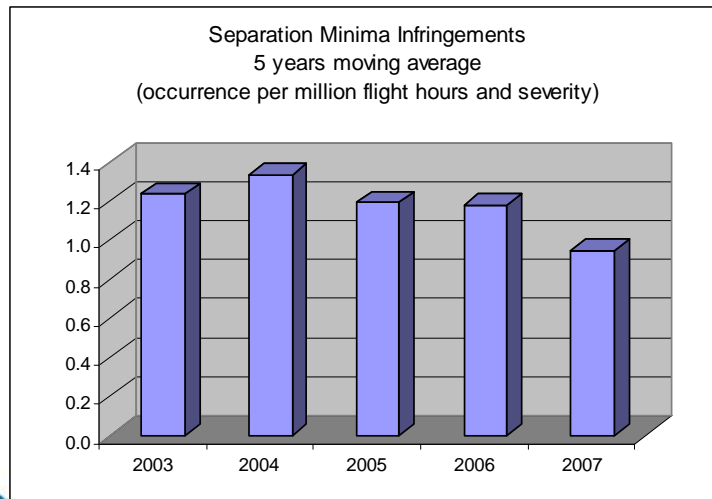
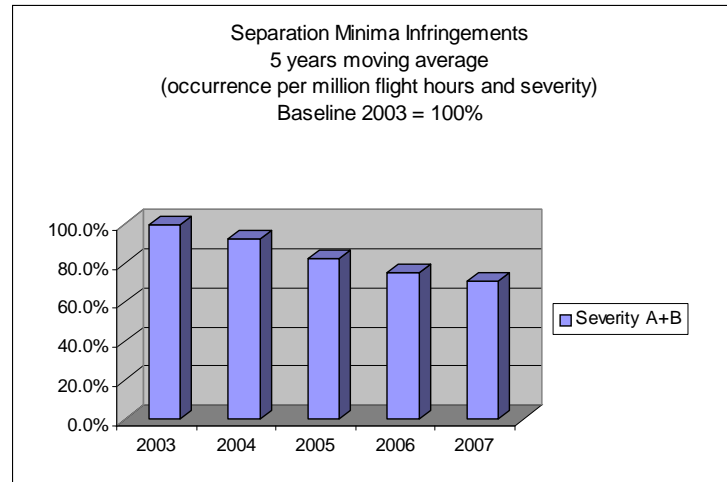
Organisational
Level
(Service Providers)

Roles &
Resp.
Who
why



The whole process needs to be a continuous improvement activity

Example of Public KPI – SMI in FABs



Summary

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- Tools and methods



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