Air France Safety Risk Management

Strategic Risk Management using Bow-Tie Risk Models

SMICG Industry Day
RIO – December 12th

Stephane CARRERES – Corporate Risk manager
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Air France key figures 2013

Worldwide network

- **78 millions passengers**
- **800 flights per day**
- **69 000 employees**
- **242 aircraft**
- **243 airports (AF/KL)**

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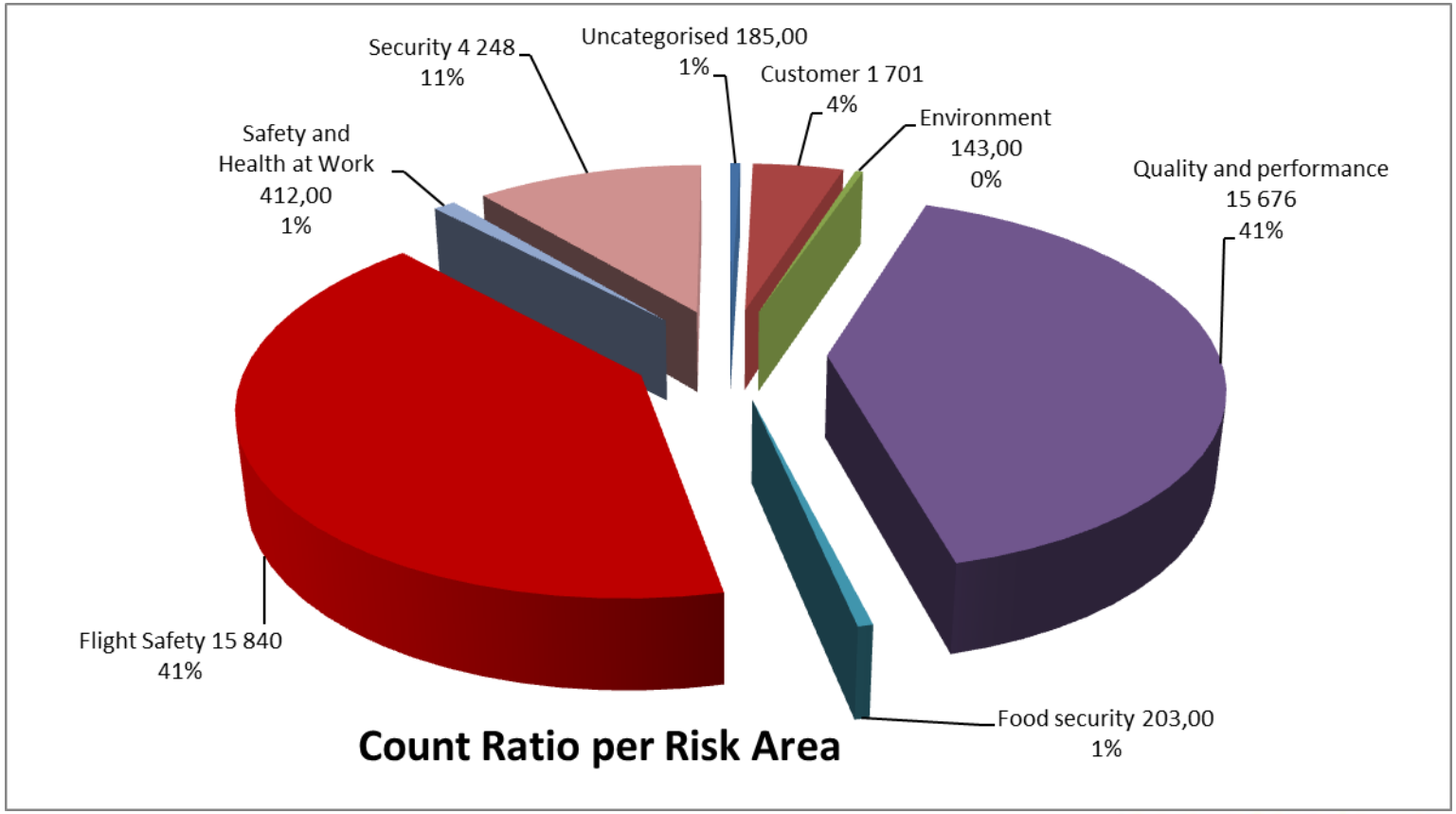
Integrated Management System Reports 2013

36 000 Reports

15 000 Safety Reports



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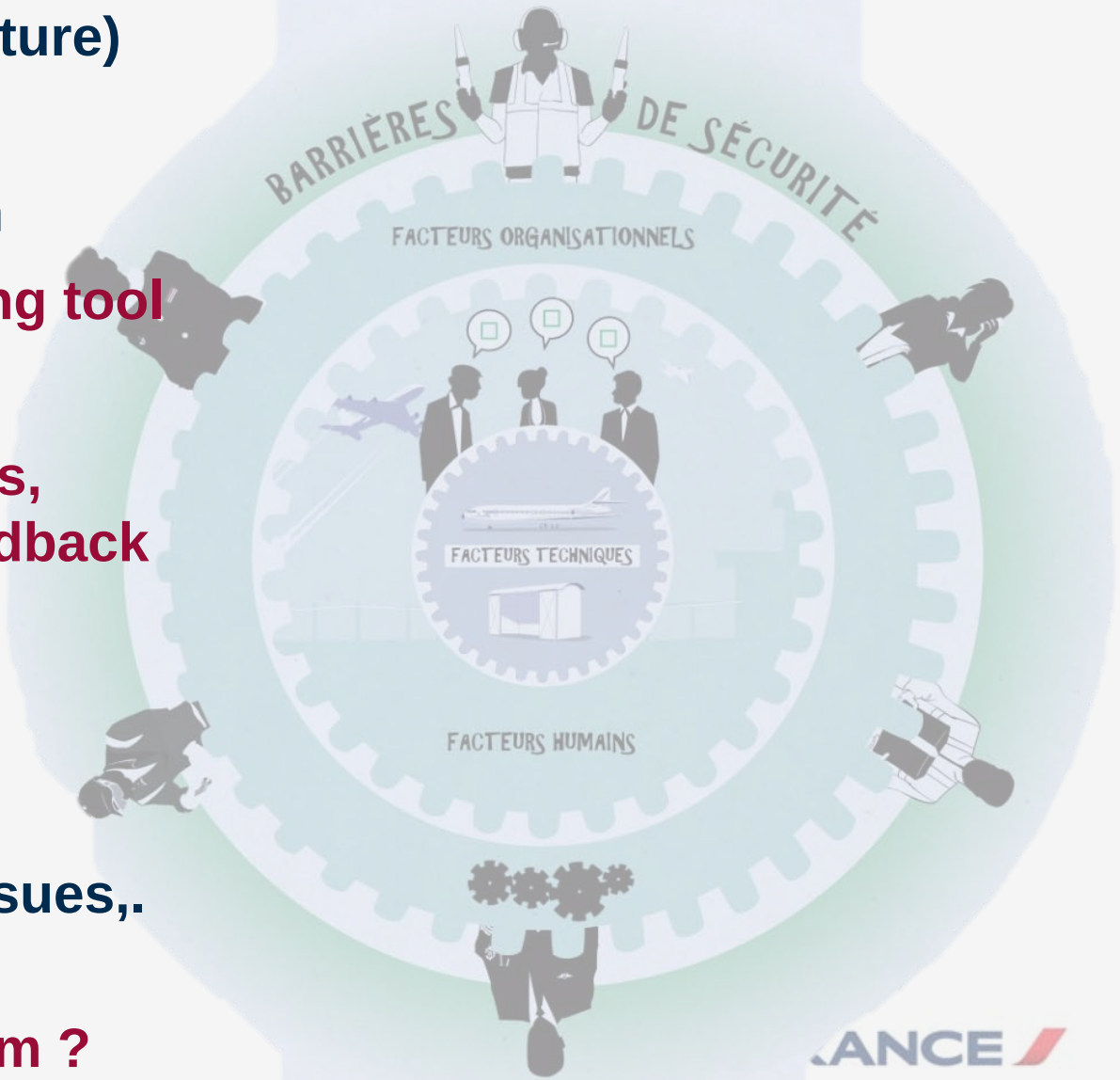
Need for IMS, SMS

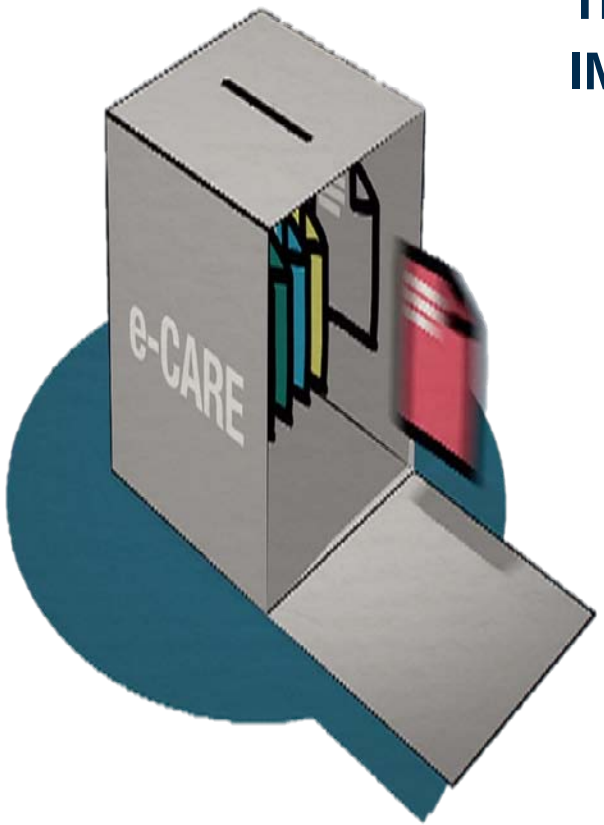
- **All involved (Safety Culture)**
  - ✓ **IMS or SMS**
- **Participative dimension**
  - ✓ **One common reporting tool**
- **Be reactive**
  - ✓ **Investigation, analysis, corrective action, feedback**
- **Be proactive**
  - ✓ **Safety barriers**
  - ✓ **Risk model**
- **Risk factors – Safety Issues,. Be Predictive**
  - ✓ **How to anticipate them ?**



Time boxing project and now on

2 years…

AF only Safety model
Training
Too rich…
Reactive, not enough proactive
Transversal
IMS orientated



Coming soon…

Aviation Industry approach : Bow tie
Barrier performances monitoring (KPI)
Extend data register to Audits, FDM, ATQP, LOSA…

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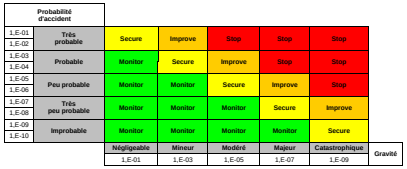
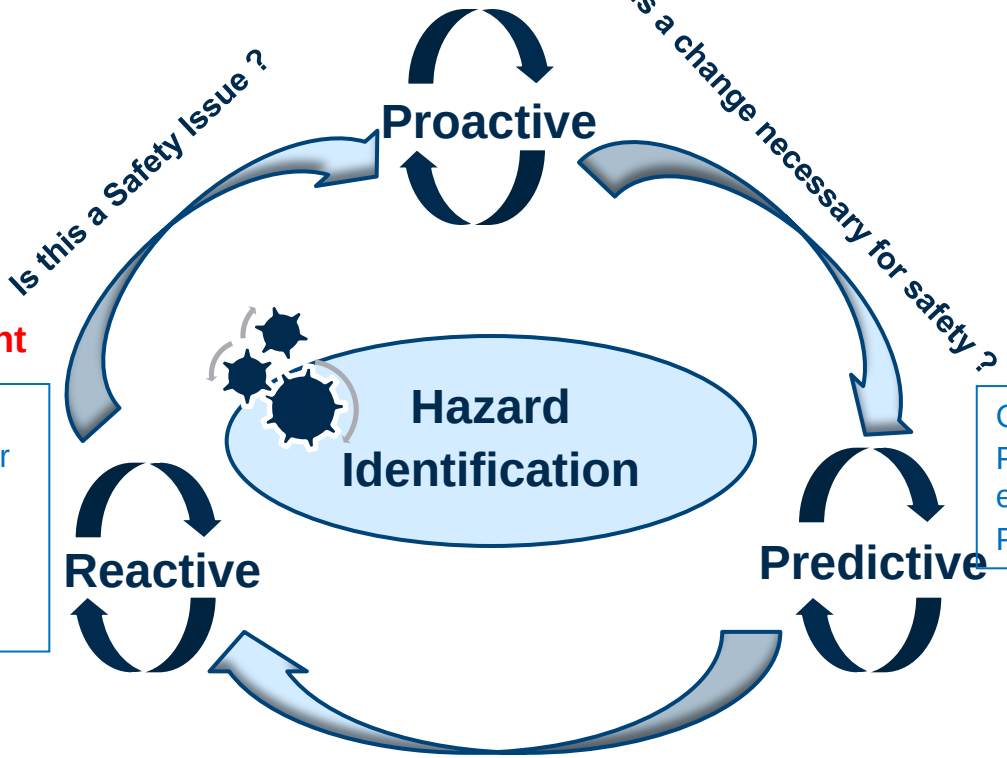
Risk Management Process

Continuous Improvement

Barrier management with Bow Ties (leading indicators)…coming soon
Safety surveys considering Safety Issues with actual hazard
Proactive action plans





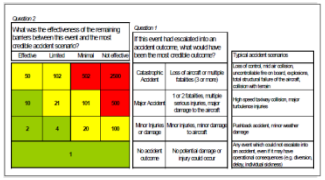
Decision of change?
Economical, strategical reasons

Occurrence Management

Event analysis
Significant failure of a barrier
Event Risk Classification (lagging indicators)
Immediate action or conservatory measure

Change Management

Change is a potential hazard
Predictive risk analysis with experts round tables
Predictive action plans



How is the new reality after the change ?

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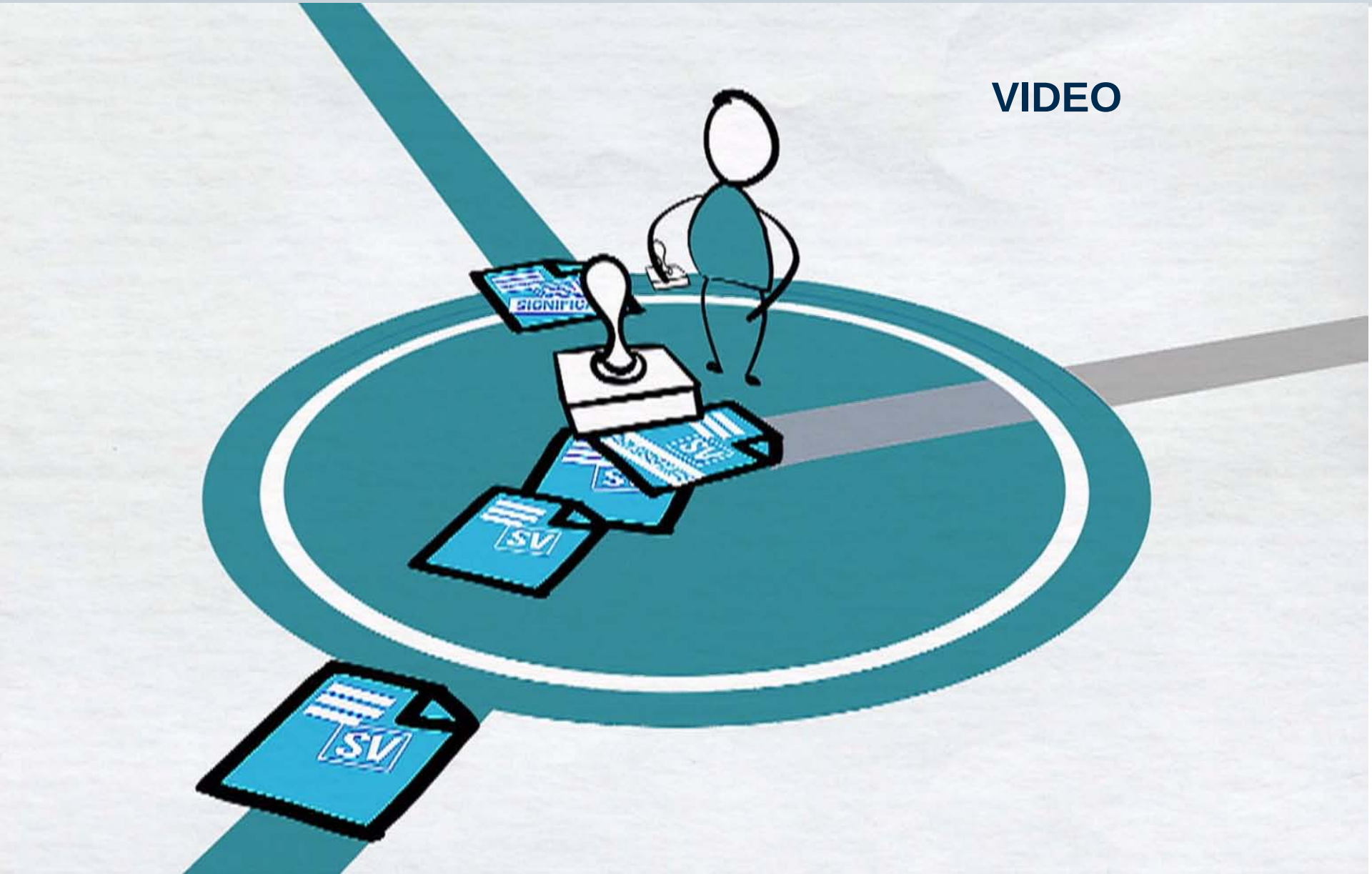
Occurrence management process

One tool : reporting, dispatching, analyzing, investigating, reacting, anticipating…



Safety Risk Management Process

Dispatching

e-CARE | Occurrence Reporting | Occurrence Reporting # REPORT-...

Save | Save & Close | Refresh | Print | More | Cancel

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Occurrence Reporting # REPORT-2014-008380

Draft Dispatch Analysis **Awaiting Closure** Closed

Report | Dispatch | Analysis | Access Control | All Tabs

Occurrence report dispatch / Orientation du rapport d'événement

Risk Categories

- [x] Sécurité des vols
- [ ] Environnement
- [ ] Sécurité-Santé au travail
- [ ] Client
- [ ] Sûreté
- [ ] Qualité-performance
- [ ] Sécurité alimentaire

Comments (Dispatch)

Attachments

Business Process & Sub Process

Save | Save & Close | Cancel

Safety Risk Management Process

SMI Risk Allocation and Assessment

Report | Dispatch | Analysis | Access Control | All Tabs

Risk Analysis/Analyse du Risque

Flight Safety	Assigned Analyst (Flight Safety)	Analysis completed (Flight Safety)
☑ Taken into account by :	MATTHIEU COLAS	◉ Yes ○ No

Environment	Assigned Analyst (Environment)	Analysis completed (Environment)
☐ Taken into account by :		○ Yes ◉ No

Occupational Safety	Assigned Analyst (Occupational Safety)	Analysis completed (Occupational Safety)
☐ Taken into account by :		○ Yes ◉ No

Suggested Reports

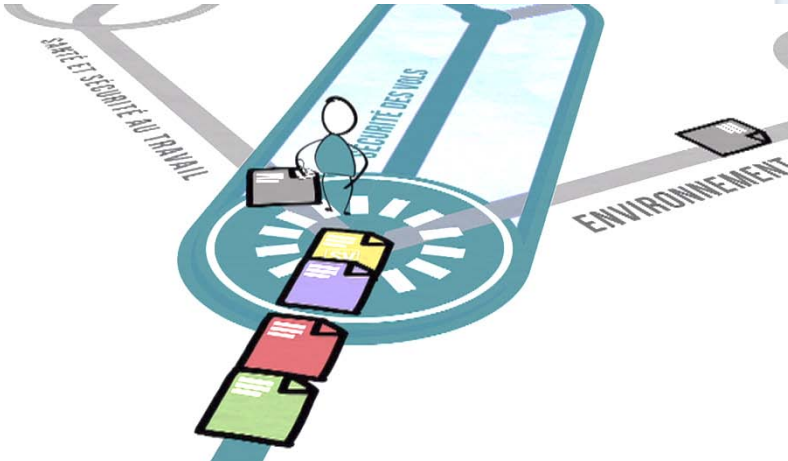
Suggested reports

#2014-007012 - RDC - GP, created 27 févr. 2014 (Closed)

#2014-006990 - ER - MESSAGE CHARGEMENT, created 26 févr. 2014 (Closed)

☐ Add all suggested reports to the related reports list

Related reports



ERC : ARMS methodology

2D Vision (scenario of accident and remaining barriers)

Analysis/Analyse - Flight Safety/Sécurité des vols

Event Risk Classification (ERC)

Question 2

What was the effectiveness of the remaining barriers between this event and the most credible 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 outcome, what would have been the most credible outcome ?

Catastrophic	Loss of aircraft or multiple fatalities (3 or more)
Major	1 or 2 fatalities, multiple serious injuries, major damage to the aircraft
Moderate	Moderate injuries or damage to the aircraft
Minor or no accident outcome	No potential damage or injury could occur

CRE DSAC BEA

Select RX if relevant

RX2

OACI Annexe 13

Attachments

Risk assessment required

Risk Assessment Flight Safety

Safety expert round table

Corporate weekly meeting (RX2)

Risk unacceptable : Immediate action, conservatory measures and safety Issue risk assessment

Risk tolerable : Risk analysis necessary

Risk acceptable : Data register

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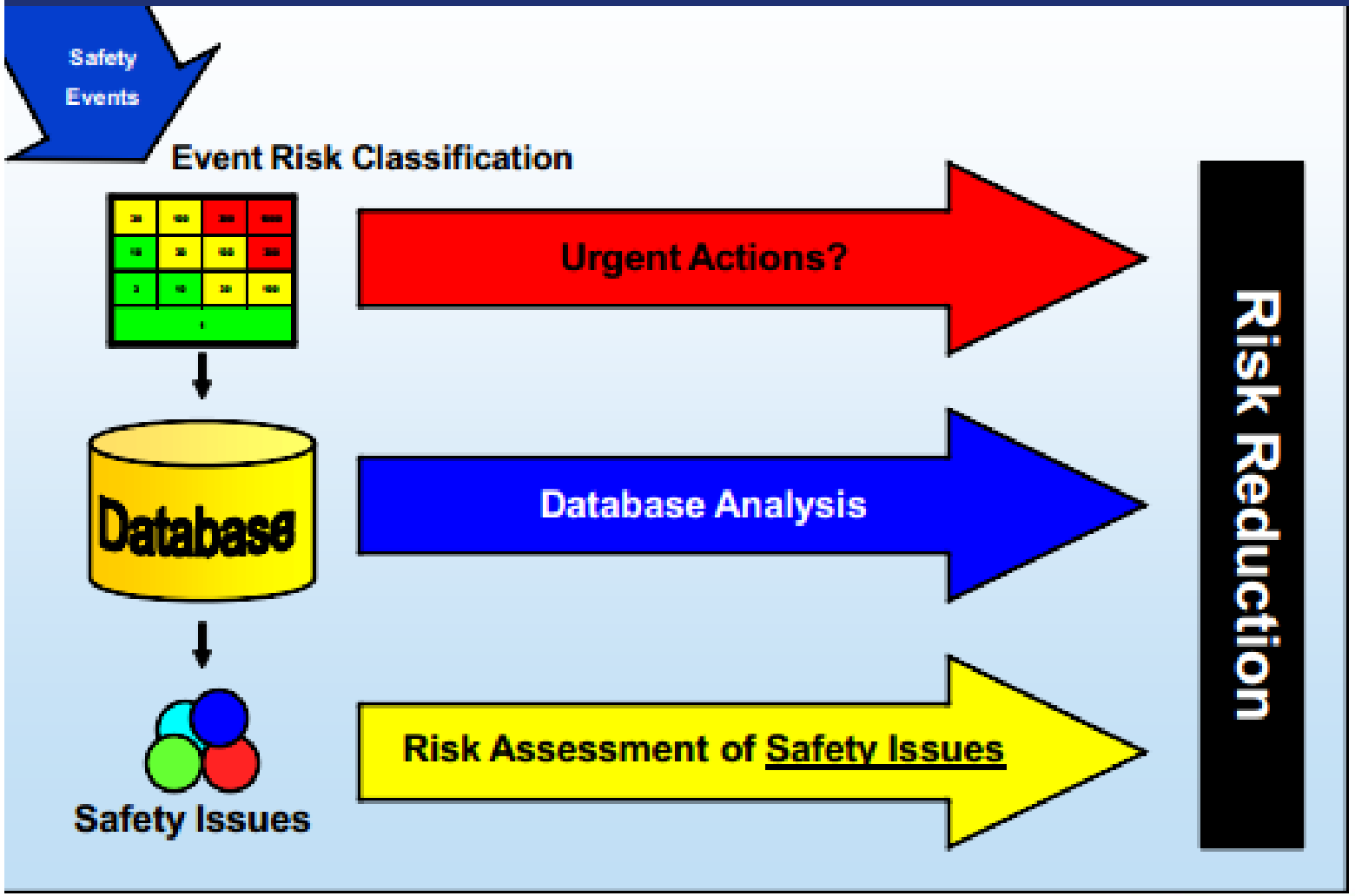
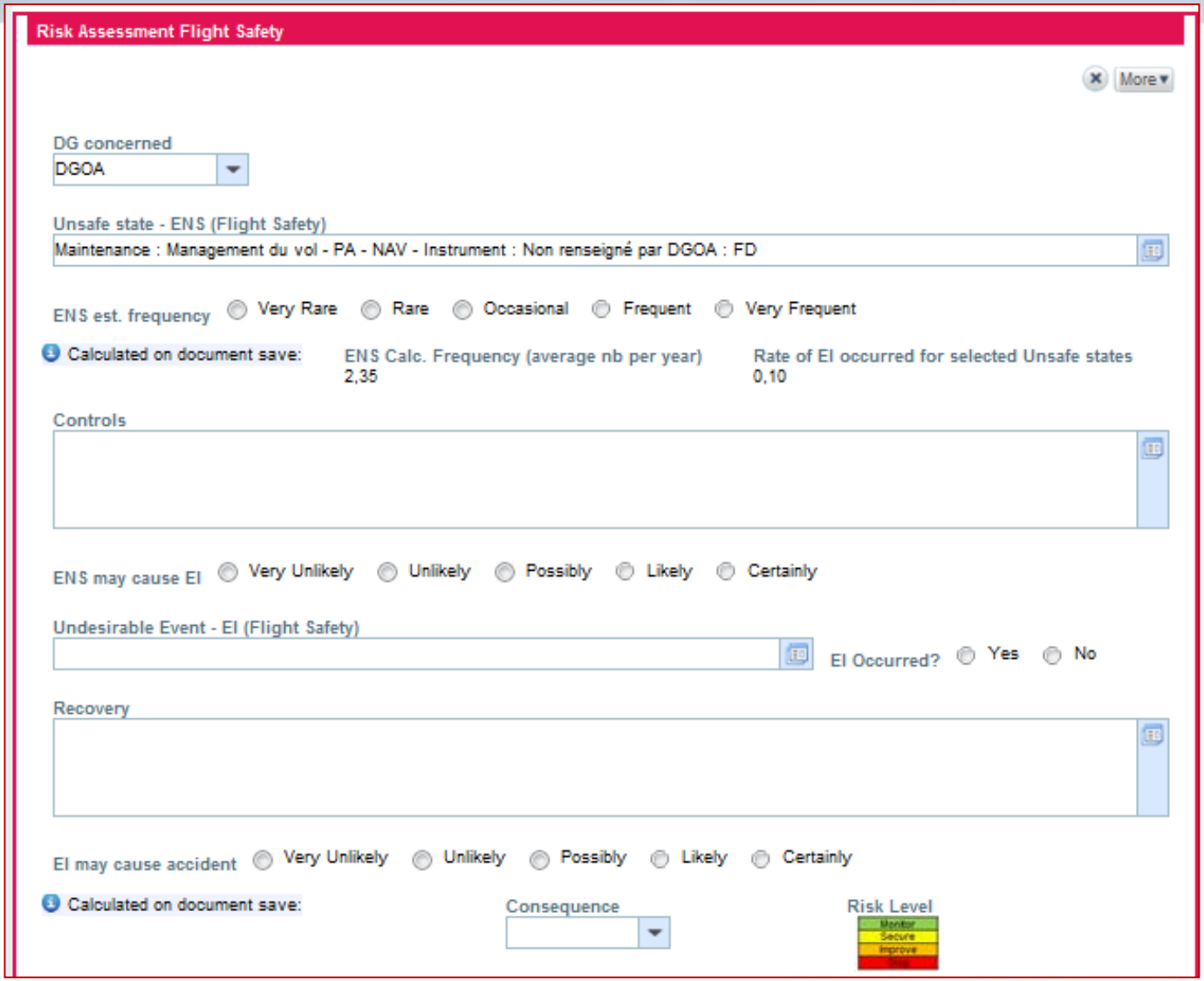
Process summary – simplified schematic



Event register and global risk assessment

- ✓Unsafe state
- ✓Control Barriers
- ✓Undesired event
- ✓Recovery Barriers
- ✓Consequence

- ✓Systemic Risk Level (estimated)



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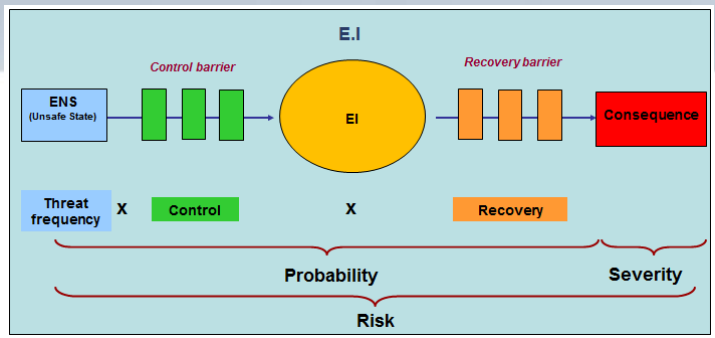
Global Risk assessment eCARE

3D Vision



Risk Assessment Flight Safety

More

DG concerned
DGOA

Unsafe state - ENS (Flight Safety)
Maintenance : Management du vol - PA - NAV - Instrument : Non renseigné par DGOA : FD

ENS est. frequency ○ Very Rare ○ Rare ○ Occasional ○ Frequent ○ Very Frequent

Calculated on document save: ENS Calc. Frequency (average nb per year) 2,35 Rate of EI occurred for selected Unsafe states 0,10

Controls

ENS may cause EI ○ Very Unlikely ○ Unlikely ○ Possibly ○ Likely ○ Certainly

Undesirable Event - EI (Flight Safety)

EI Occurred? ○ Yes ○ No

Recovery

EI may cause accident ○ Very Unlikely ○ Unlikely ○ Possibly ○ Likely ○ Certainly

Calculated on document save: Consequence Risk Level

Threat frequency

Probability of control barrier failure

Probability of recovery barrier failure

Systemic Risk Level

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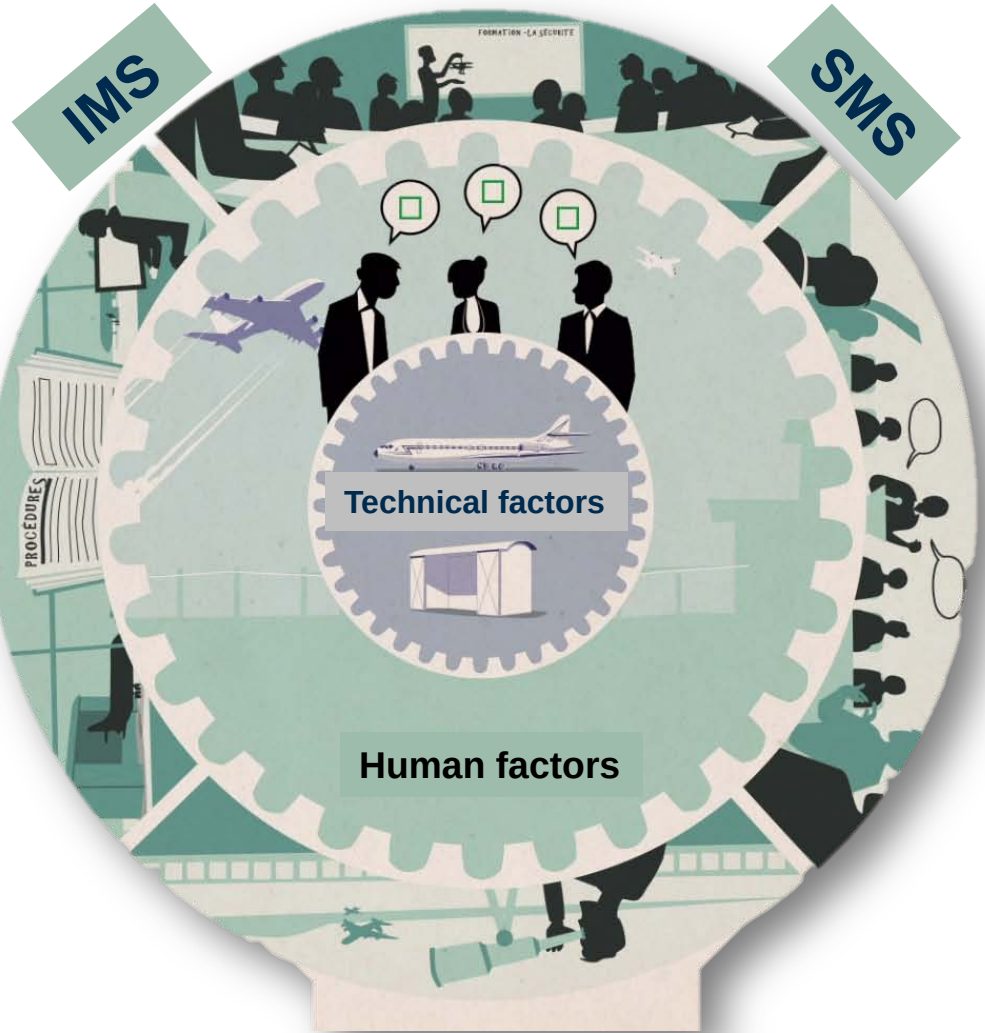
SMS automation with eCARE*

* ETQ reliance = AF eCARE

eCARE New Generation 2015



- Bow Tie
- Barrier management
- Facilitated analysis
- Flight safety lagging and leading indicators
- Fully integrated ERC
- Full cooperation (Arms, ETQ, Bow Tie XP and you !!! …)

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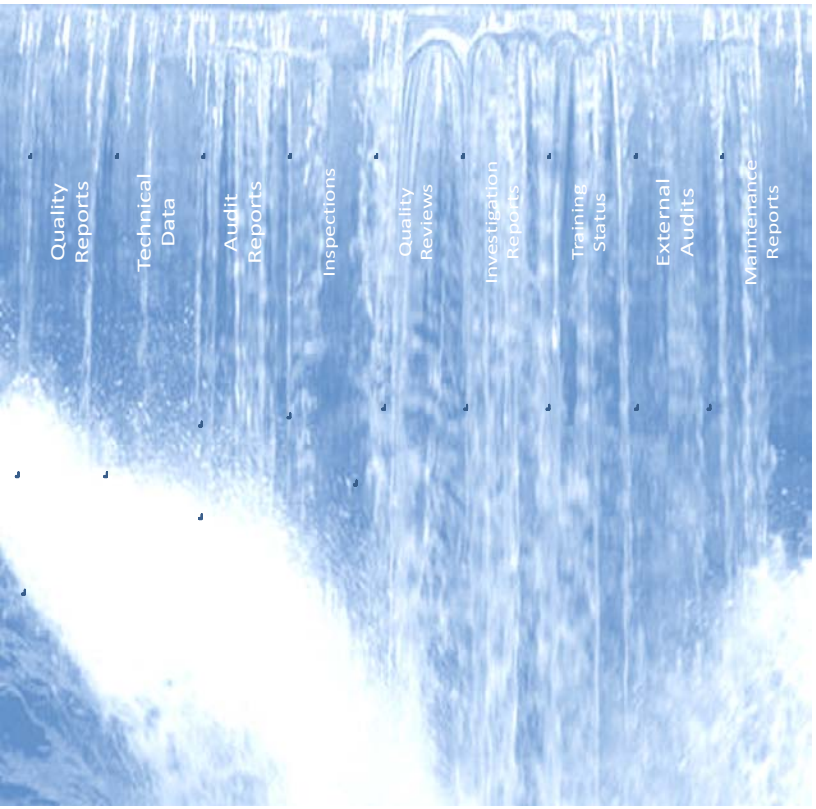
The Risk Question



?

What does all this "small stuff" tell you about the risk of the "big stuff"?

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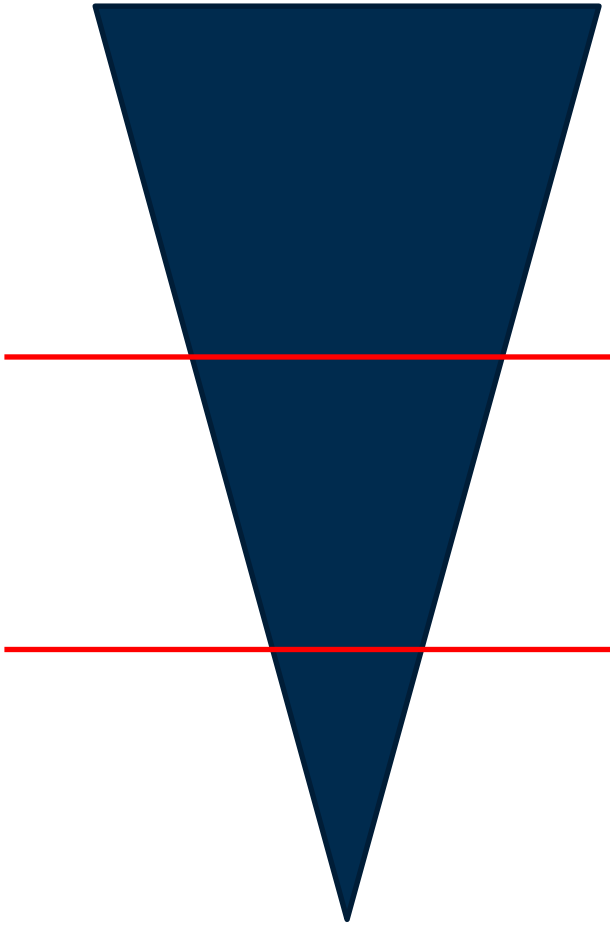
A Strategic Approach to Risk



Strategic Risk Management

- Timeframe annual
- Major Risks – Safety, Quality, Compliance
- Update BowTie Models

Tactical Risk Management

- Timeframe months
- Risk Dashboard Trends
- Focussed action

Event Risk Management

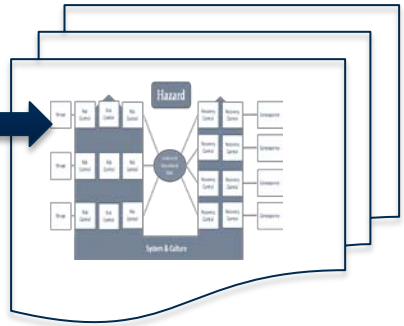
- Response – investigate or add to data?
- What does this event add to the picture?

Global picture

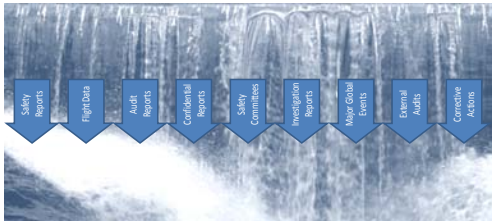
Global Experience (Big Stuff)

Organisational Learning Engine

BowTie Risk Models

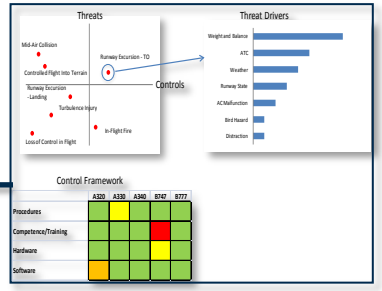


Internal Data (Small Stuff)



Data Taxonomy Engine

Risk Dashboards



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The AF "Small" Stuff

investigate or add to data ?

Air France
15 000
Safety Reports
per Year

Other Sources :
Audit, Flight Data Monitoring, LOSA, ATQP…

20% Significant events
=> reactive process

investigate

80% Precursors, weak signals (lack ones) => Data Input only

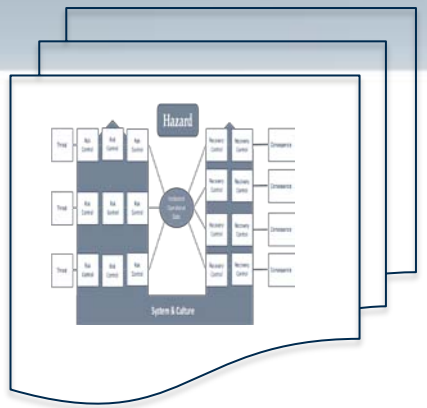
add to data

Investigations
Action plans

Safety Issues
=> Safety Survey and recommendation

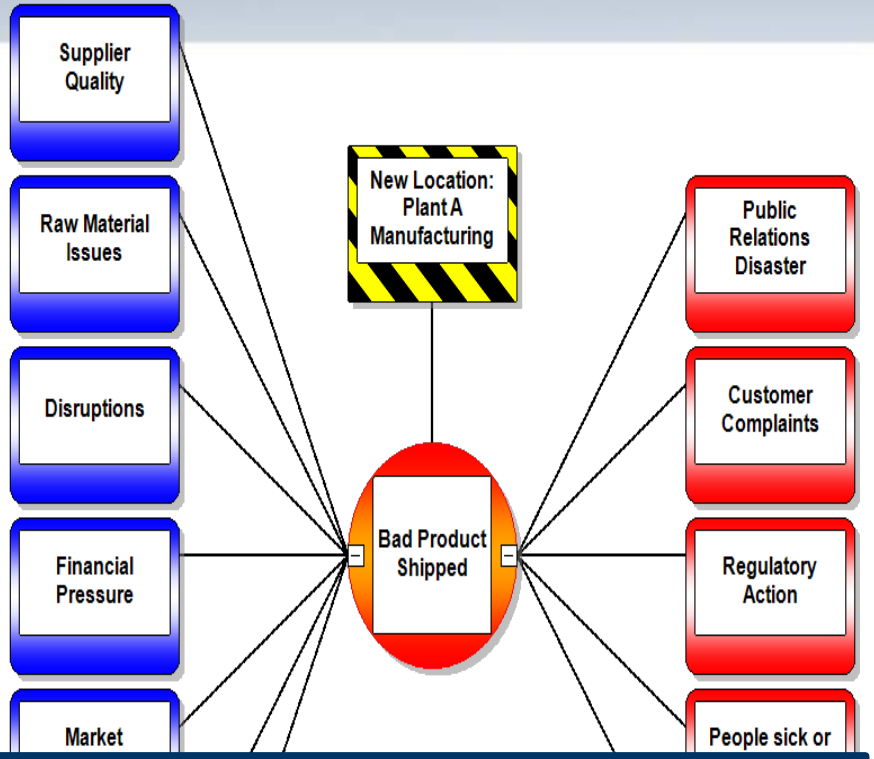
monitoring leading indicators (barriers)

Bow-Ties Project



Control Framework

- Process Design
- Testing
- Training
- Equipment
- Software
- Policies & Procedures
- Maintenance



Air France project : “Safective”

- Project team structure
- 2 consultants + 1 full time trainee
- 5 operational division and the Corporate level involved
- More than 1 year project to go from actual Risk model to Bow Tie
- IT needs, CGE/ETQ/Aloft help, Industry (Arms and SMICG…)
- Process review
- Training, testing…

Bow Tie in a corporate approach within Air France

Flight Safety Risk Management is mainly focused on significant 7

1st idea : Flight Ops culture

Generic Bow-Ties

Fine but not enough :

Flight Safety depends on all operational departments in Flight Ops,
Cabin
Ground Ops,
Cargo,
Maintenance,
Operations Control Center

Each department shall describe its own operational processes in the Bow-Ties

Operational Division BOW-Ties

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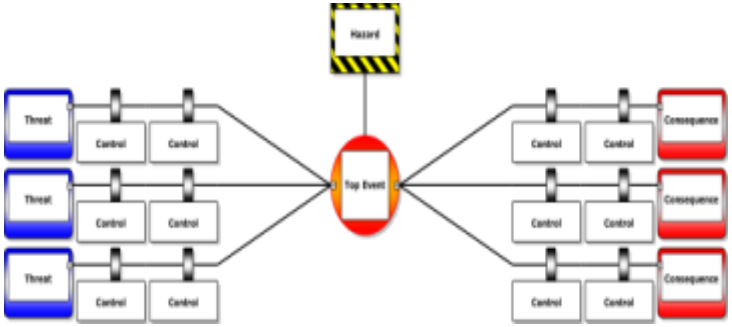
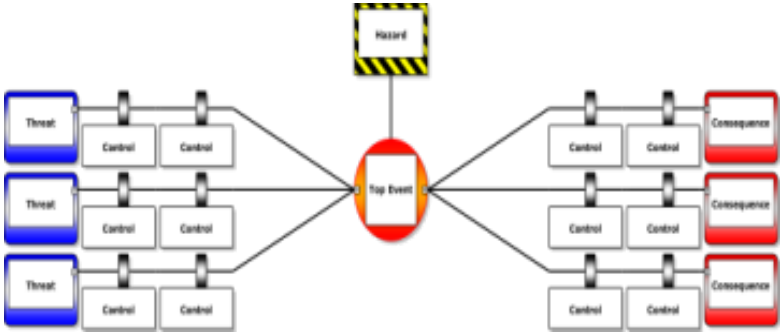
2014 Bow-Ties set up : coordinate operational divisions

- ✓ Help divisions describe their own risk-based processes
- ✓ Coordinate the bow-ties at the corporate level to make sense

Ground Ops process



Flight Ops process



LDS / NOTOC not reflecting actual loading at doors closed

Take Off misconfiguration or outside performance assumption

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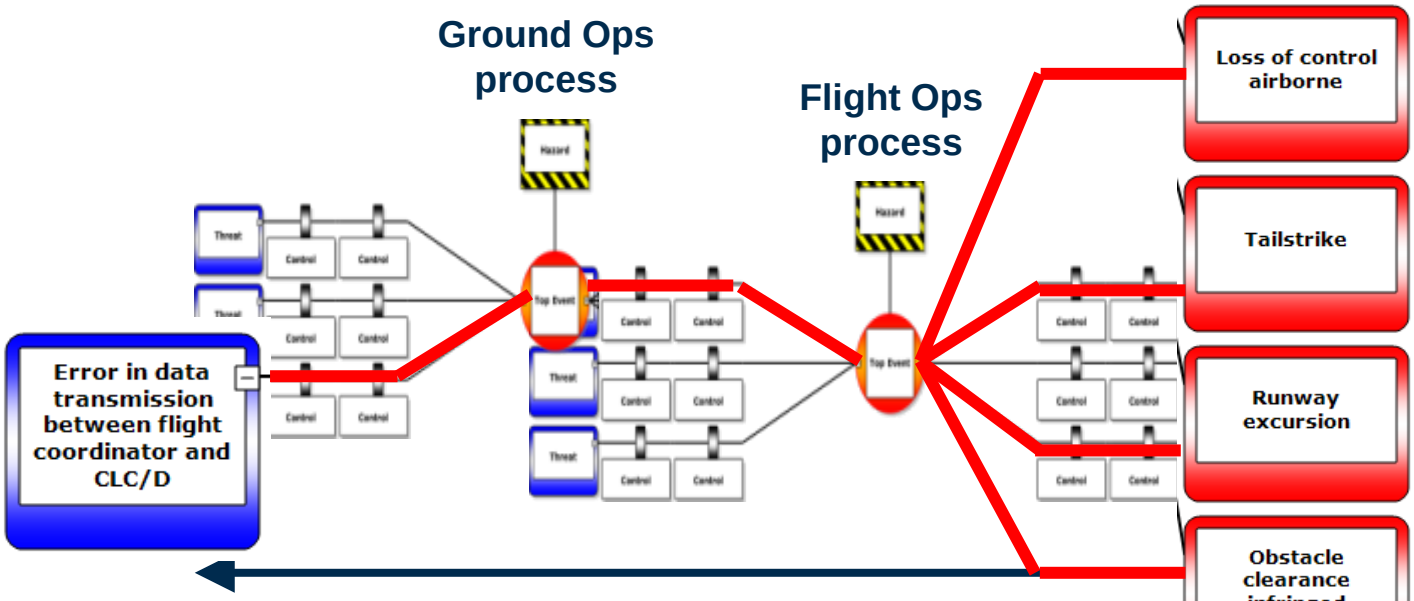
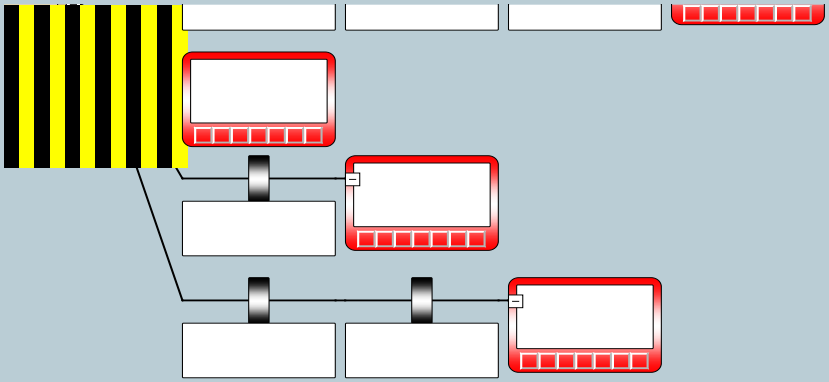
Facilitate safety culture and safety communication

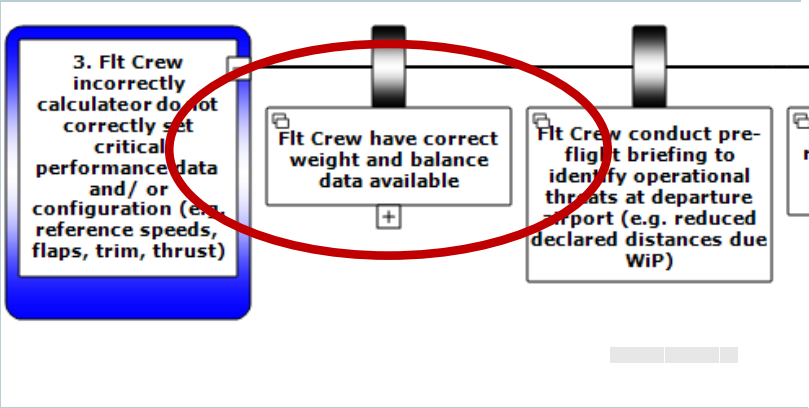


and Risk Assessment !!

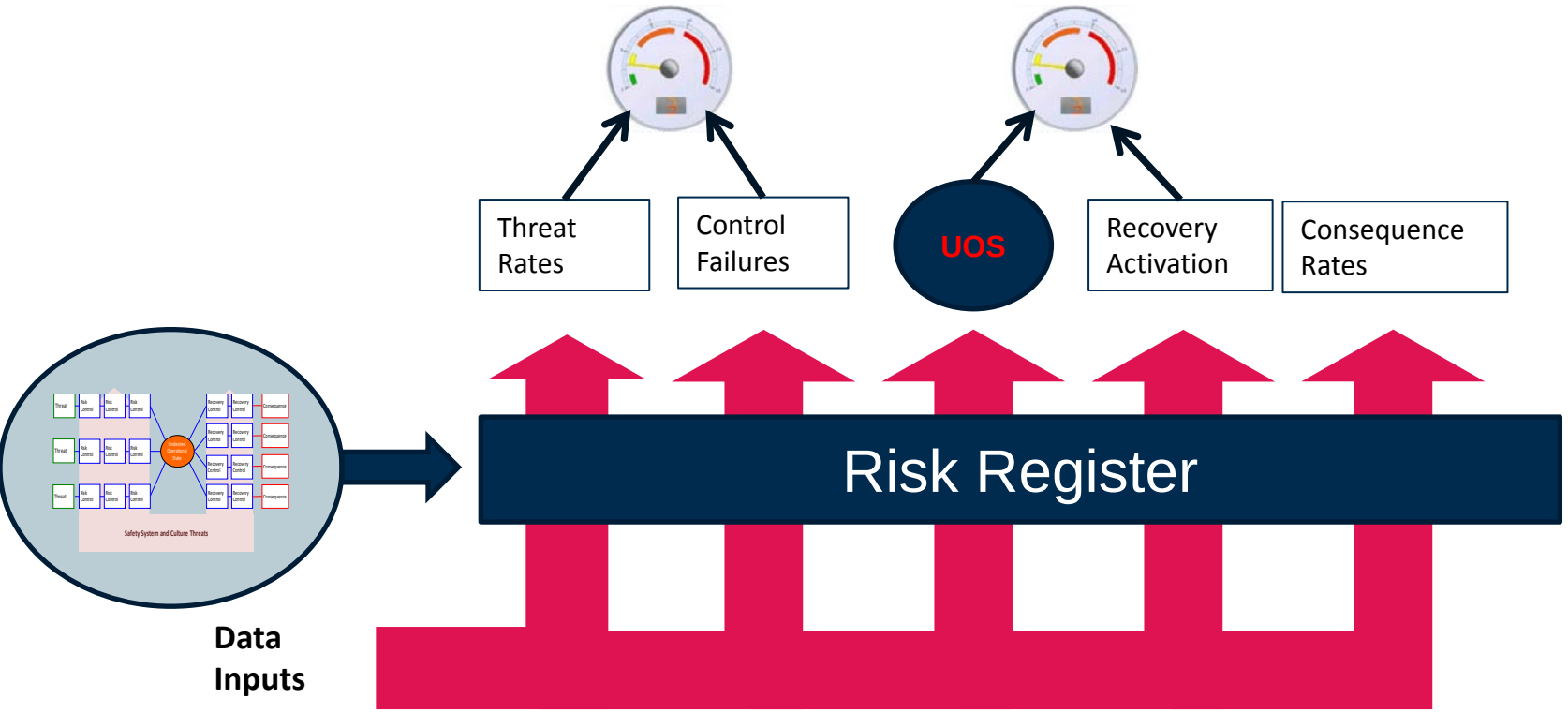
.....

AF Ground Ops 9.5 : Load sheet / NOTOC incorrect at doors closed : not reflecting actual load or not taking into account aircraft operational limits)





Data Taxonomy Based on BowTie Models



Bowtie XP Integration

CGE Bow Tie
And
eCARE Reliance

Risk Item document

Hazard/Top event
Threats
Consequences
Controls
Escalation Factors

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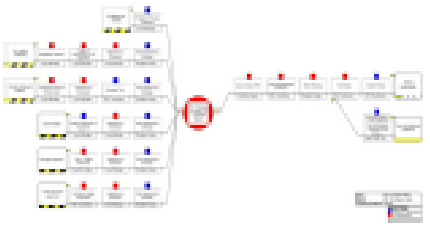
Risk Classification



Threats and Preventive Controls

Hazard : Threat : Control — ☑ Failed

Working at Heights : Unsafe mobile work platform : Certification

Hazard : Threat : Control — ☑ Failed

Working at Heights : Unsafe mobile work platform : Inspection by Contractor

Hazard : Threat : Control — ☑ Failed

Working at Heights : Unsafe mobile work platform : Inspection by Company

Consequences and Recovery Controls

Hazard : Consequence : Control — ☑ Failed

Working at Heights : Serious Injury : Personal Awareness

Hazard : Consequence : Control — ☐ Failed

Working at Heights : Serious Injury : Use of Correct PPE

Event Risk Classification

Safety, Security or Safety Issue

Question 2

What was the effectiveness of the remaining barriers between this event and the most credible 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 outcome, what would have been the most credible 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)

Event document

- Event description and classification
- Effectiveness of Controls
  - Hazard : Threat : Preventive Control
  - Hazard : Consequence: Recovery Control
- Risk Assessment
  - Severity of Most Credible Consequence
  - Overall Effectiveness of Remaining Controls
  - Likelihood of reaching consequence

Corrective Action

Risk Level

Alert

ERC Arms Methodology

Air France participation

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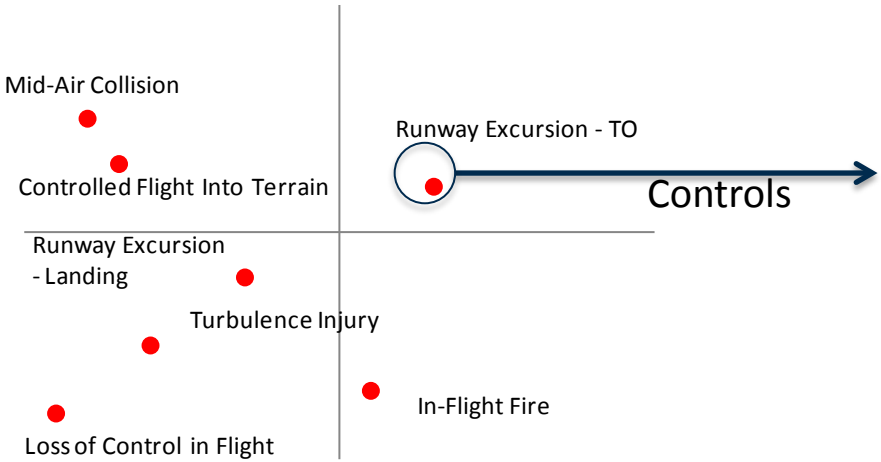
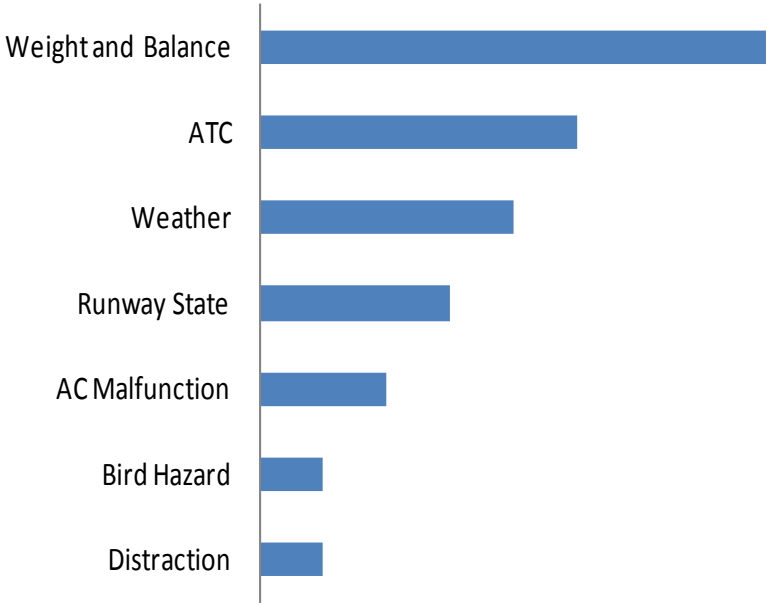
Risk Dashboards (Leading and Lagging indicators)

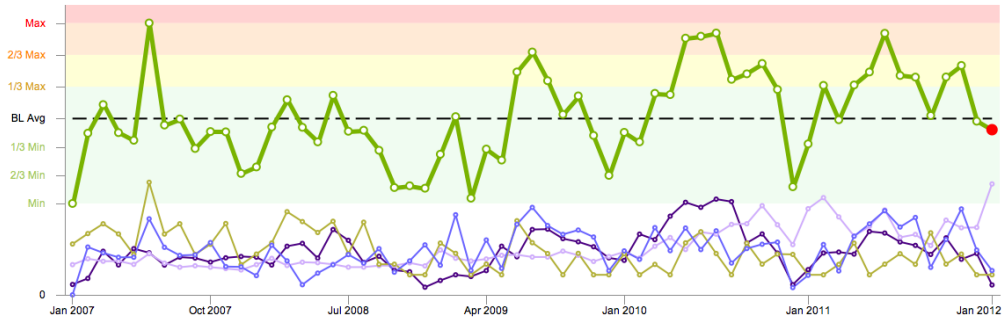
Threats



Threat Drivers



Risk Trends



Barriers Management

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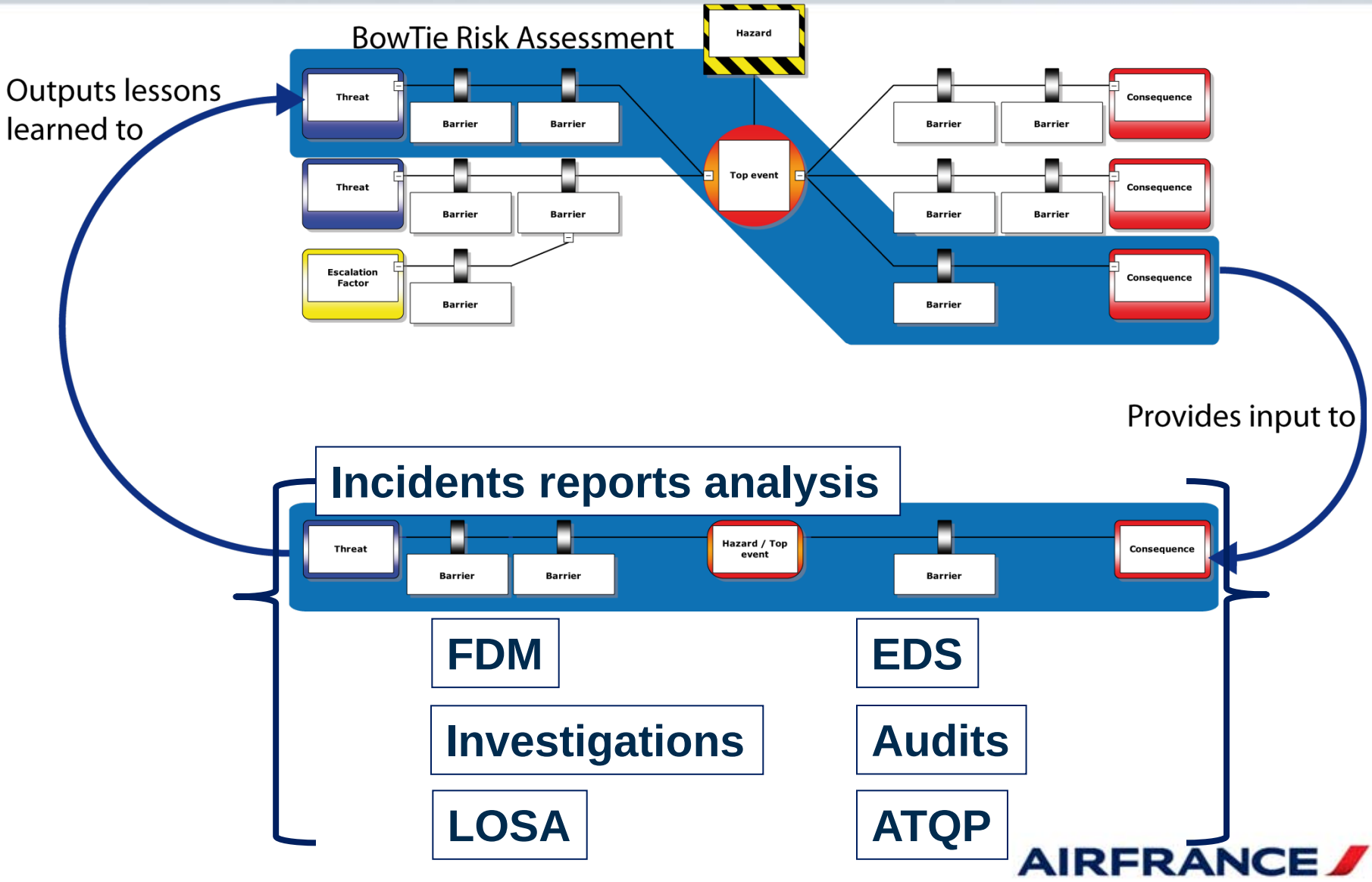
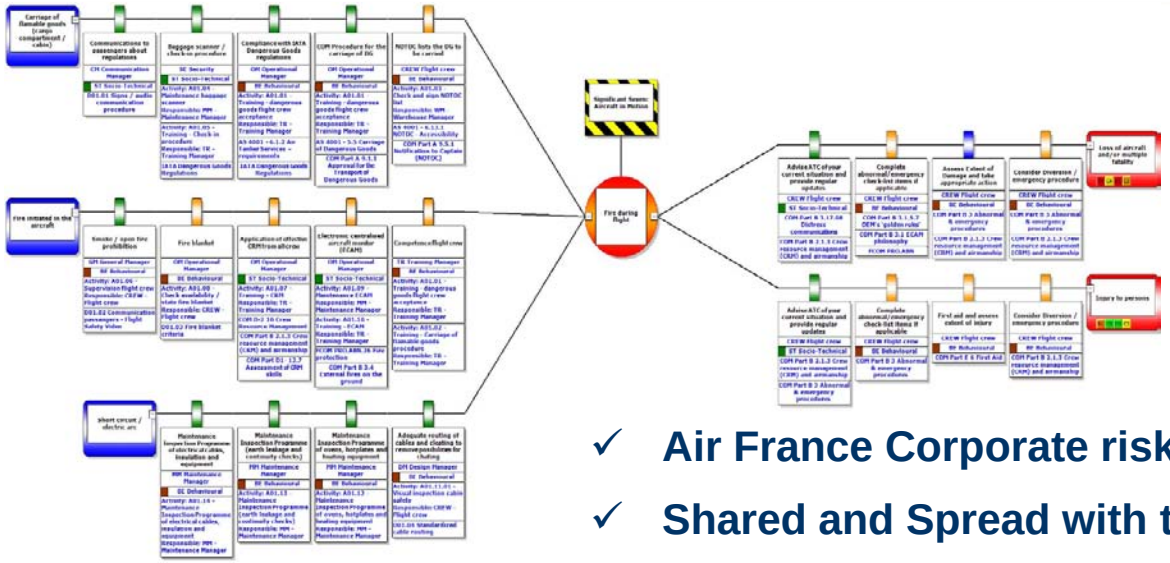
Continuous monitoring with all operational data



Perspective 2015



Bow-Ties Model
Our expectations…

- ✓ Air France Corporate risk model : Bow-Ties
- ✓ Shared and Spread with the industry (SMICG, Webinar…)
- ✓ Tool for investigation and event analysis
- ✓ Easier risk assessment
- ✓ Barrier management (KPI), leading indicators
- ✓ Integrate Audits, LOSA, FDM, ATQP, Reports with HF
- ✓ Training and comprehensive material
- ✓ Collaborative work with editors and consultants
- ✓ Full SMS Dashboard

EtQ

ALOFT AVIATION CONSULTING

CGE Risk Management Solutions

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Great but let's not forget …

Safety Culture

Just and Fair

Collective Memory