Risk assessment using the ARMS Methodology

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Summary

1. Introduction – Aviation in Luxembourg
2. ARMS Methodology
3. Handling of occurrence reports
4. From occurrence report to Risk assessment
5. Software implementation
6. Obstacles cleared and obstacles ahead

1. Aviation in Luxembourg

1 Airport:

- 2,2 million passengers
- 673.500 t cargo

3 grass airfields
5 heliports (hospitals)
2 helidecks on ships

3 ANSPs

Picture:
Administration de la Navigation Aérienne

DIRECTION DE L'AVIATION CIVILE
GRAND-DUCHÉ DE LUXEMBOURG

1. Aviation in Luxembourg

8 AOCs

290 aircraft on register

Direction de l'Aviation Civile personnel: 50

State Safety Programme:

Awaiting legal base –

draft *Règlement grand-ducal* submitted for approval

2. ARMS Methodology

Aviation Risk Management Solutions

2 separate assessments:

1. Event Risk Classification ERC for occurrences
2. Safety Issue Risk Assessment SIRA for safety issues

Why 2 separate assessments?

- Risk = Frequency x Severity - *how to assess the « frequency » of 1 occurrence?*
- The « Barrier » model – *how to integrate it in risk assessment?*
- Development of a « Safety Issue » database

2. ARMS Methodology

1. ERC – Event Risk Classification

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)

2. ARMS Methodology

2. SIRA – Safety Issue Risk Assessment

1. Define:	**2. Estimate frequency…**
Triggering event	…of event (every … flights)
Barriers to avoid UOS	…how often the barriers fail
UOS - Undesired operational state	…of event
Barriers to recover from UOS	…how often the barriers fail
Accident outcome	***Result: estimated accident frequency***

4. Compare

3. Assess:	
Accident severity (catastrophic / major / minor / no acc.)	***Result: tolerable limit (1 every … flights)***

3. Handling of occurrence reports

DAC safety management & occurrence handling department:

2 persons

Safety Action Group:

safety department + 1 member from each safety oversight department:

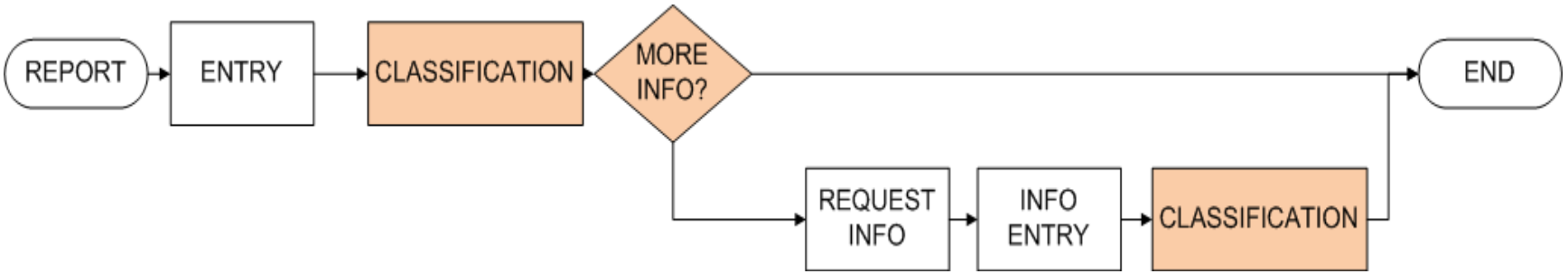
- Airworthiness
- Operations
- NSA
- Aerodromes

Members provide expertise and link to their department

Weekly meeting for occurrence classification and risk assessment

3. Handling of occurrence reports

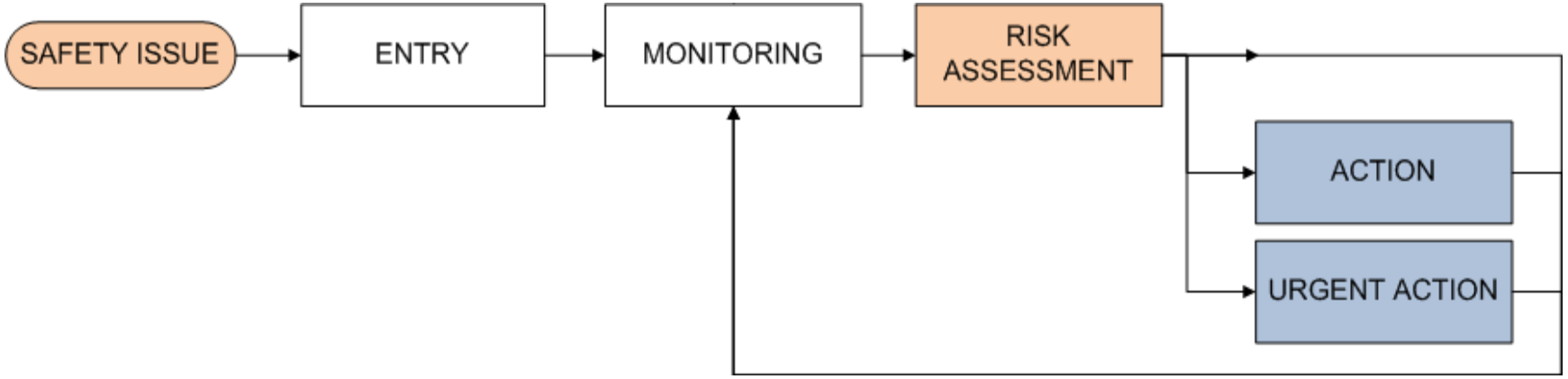
Occurrence handling workflow:



ERC classification implemented since July 1st 2013

4. Handling of safety issues

Safety Issue workflow:

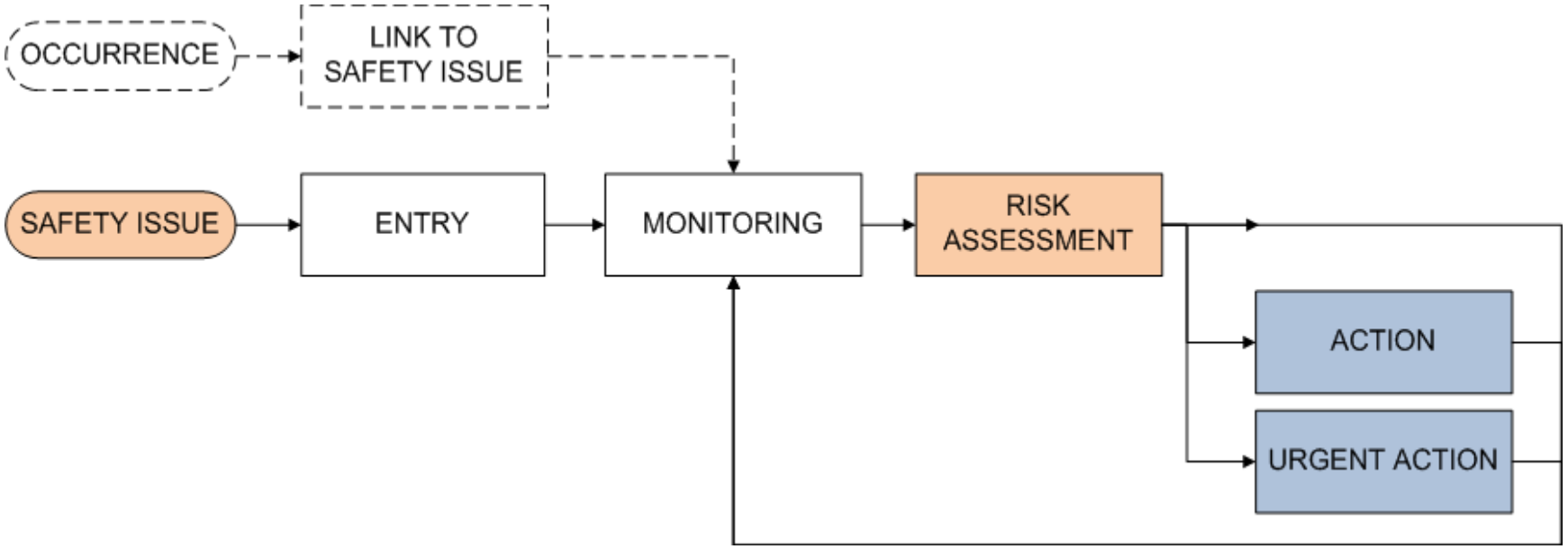


Identify safety issue: safety department / Safety Action Group

Risk Assessment: Safety Action Group

Action or urgent action: any department concerned or operators' SMS

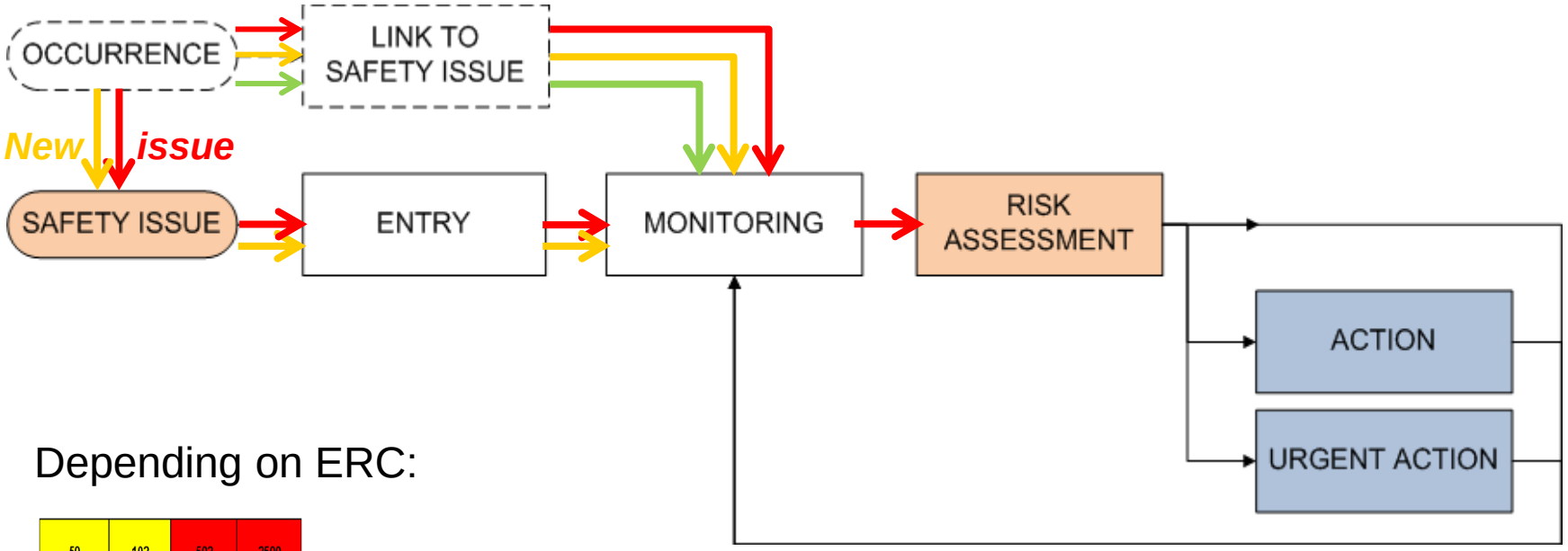
4. Handling of safety issues



Occurrences linked to Safety Issue

Safety Issue Risk Assessment implemented since October 1st 2013

4. Handling of safety issues

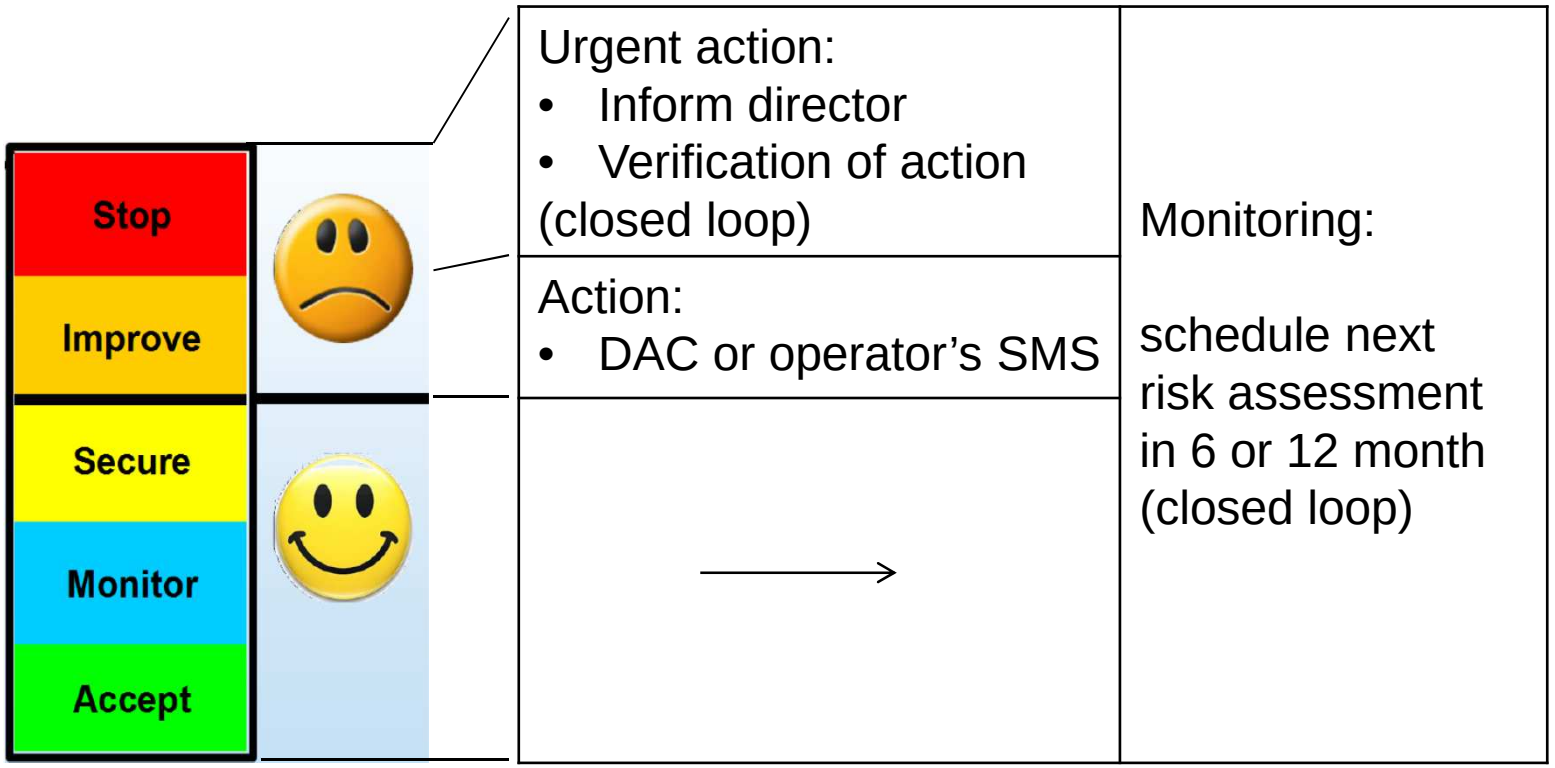


Depending on ERC:

Green: link to Safety Issue (if S.I. exists)
Yellow: link to Safety Issue (create S.I. if necessary)
Red: link to Safety Issue (create S.I. if necessary) + RA

4. Handling of safety issues

Actions:



4. Handling of safety issues

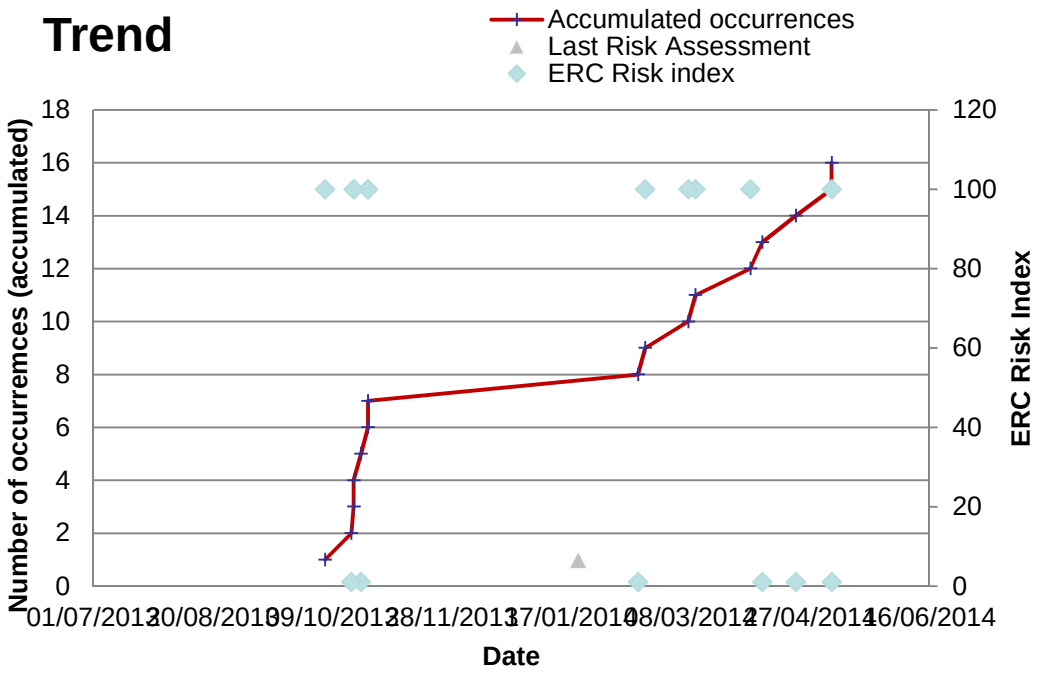
Data available per Safety issue:

- Number of related occurrences
- Sum of ERC Risk indexes
- Average of ERC Risk indexes

Example:

Birdstrikes at ELLX

Start date (1st. Occ)	06/10/2013	**Number of occurrences**	16
		Average ERC Risk index	62,9
Date of last RA	20/01/2014	**Number of occurrences**	9
		Average ERC Risk index	56,0



4. Handling of safety issues

Risk assessment

- Scheduled (due dates)
- Performed by the Safety Action Group
- Quick assessment (ca. 20 min.)
- To be repeated every 6 or 12 month

5. Software implementation

Software to manage workflows:

- Occurrence reporting workflow
  initial report(s) as attachment
- SIRA (Safety Issue and Risk Assessment) Workflow
  Link between 1 Safety issue and many occurrences

Features:

- Easy to use (Safety Action Group)
- User-defined screen layout
- Search/Filter the list of occurrences and list of safety issues
- Export to MS Excel (data from the list of occurrences or safety issues)
- Creation of forms (data from 1 Occurrence / 1 Safety Issue)

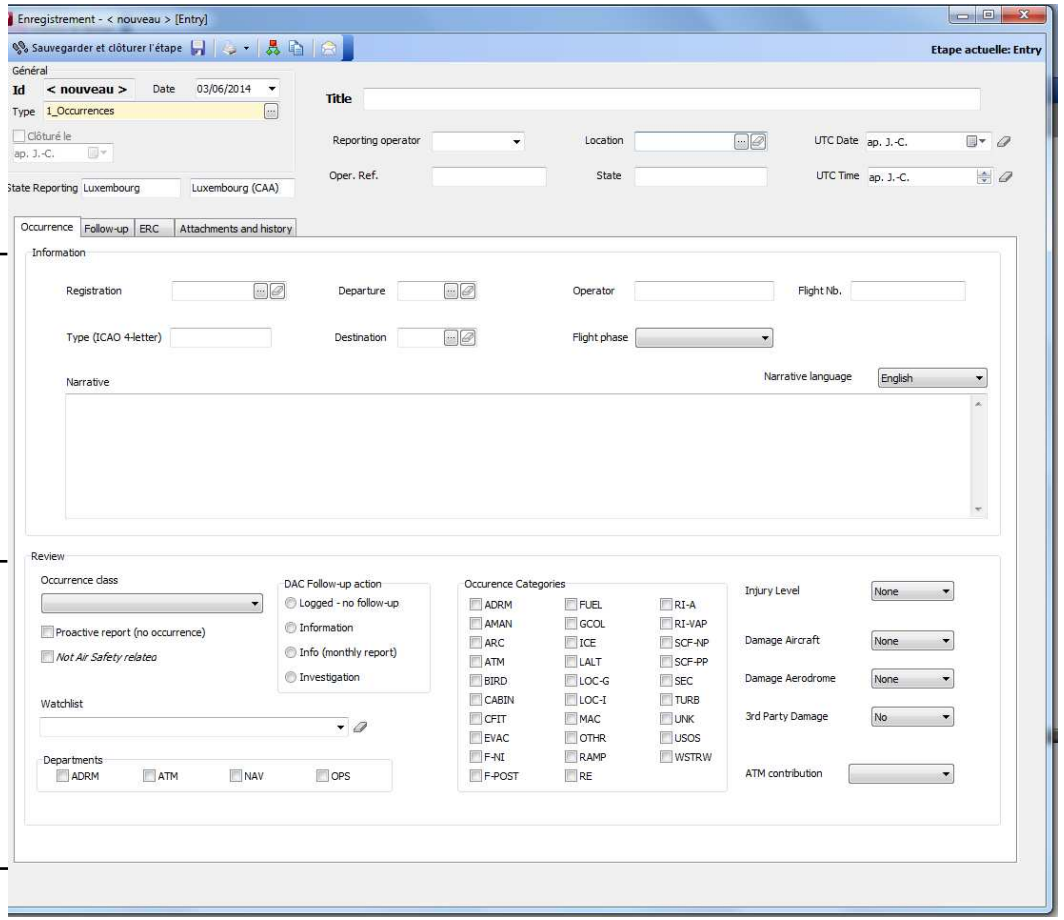
5. Software implementation

Occurrence report

Title, date, location

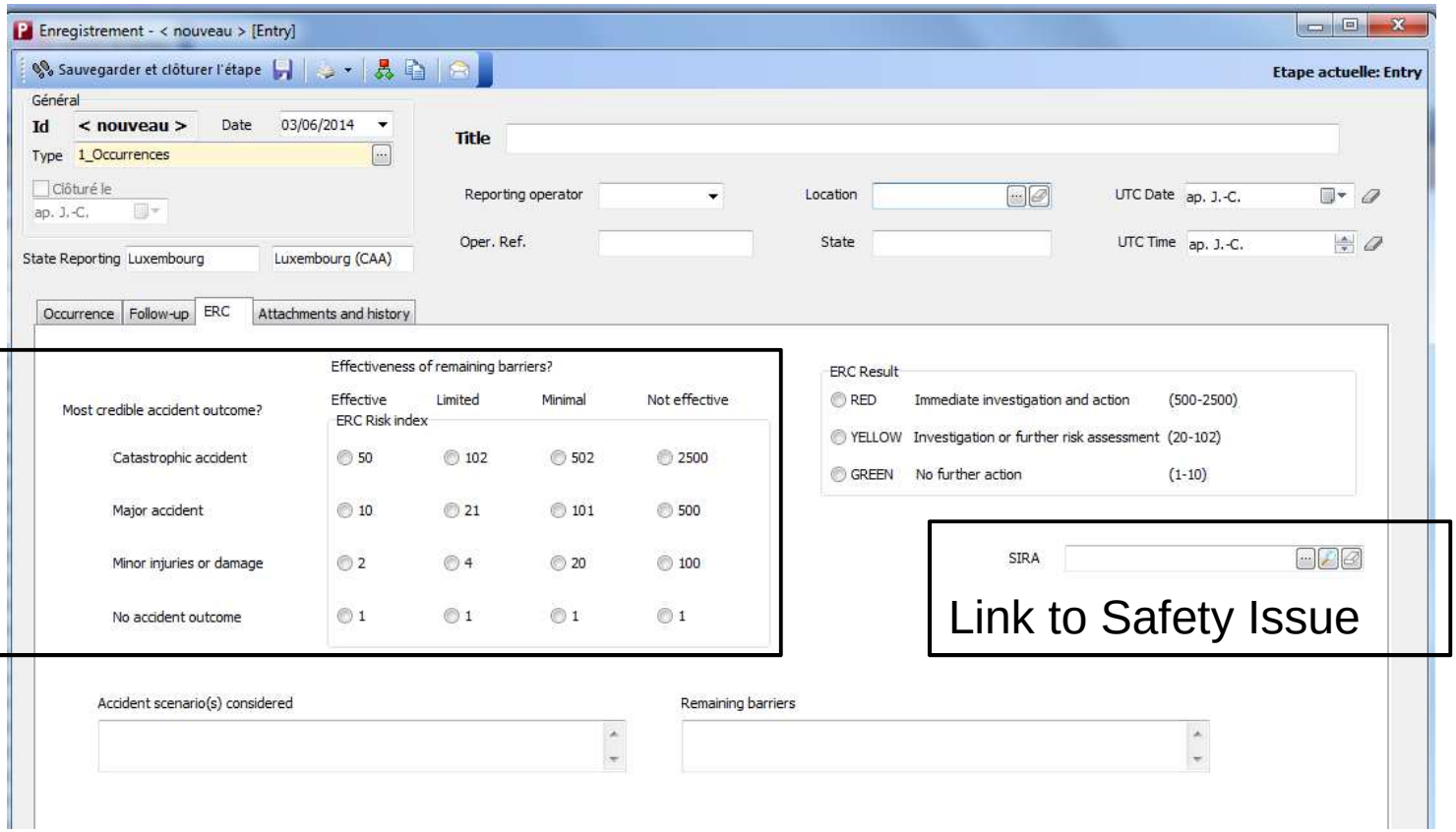
Information:
Aircraft, flight
Narrative

Classification / Categorisation



5. Software implementation

Occurrence report



ERC Risk Index

Link to Safety Issue

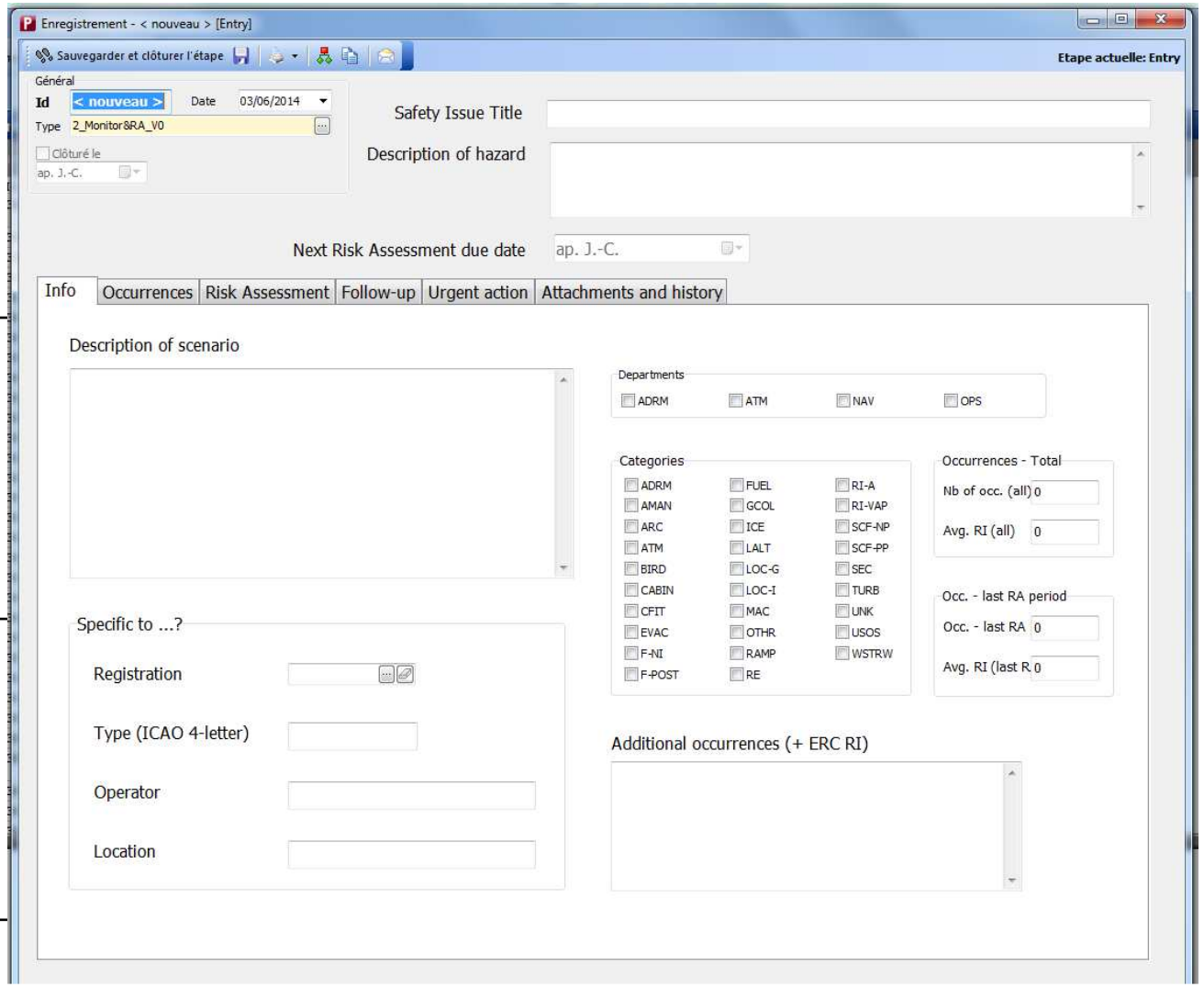
5. Software implementation

Safety Issue

Title
Date of next RA

Information:
Scenario
Categories:
CICTT,
departments

Limitations:
Specific…
…aircraft?
…operator?
…location?



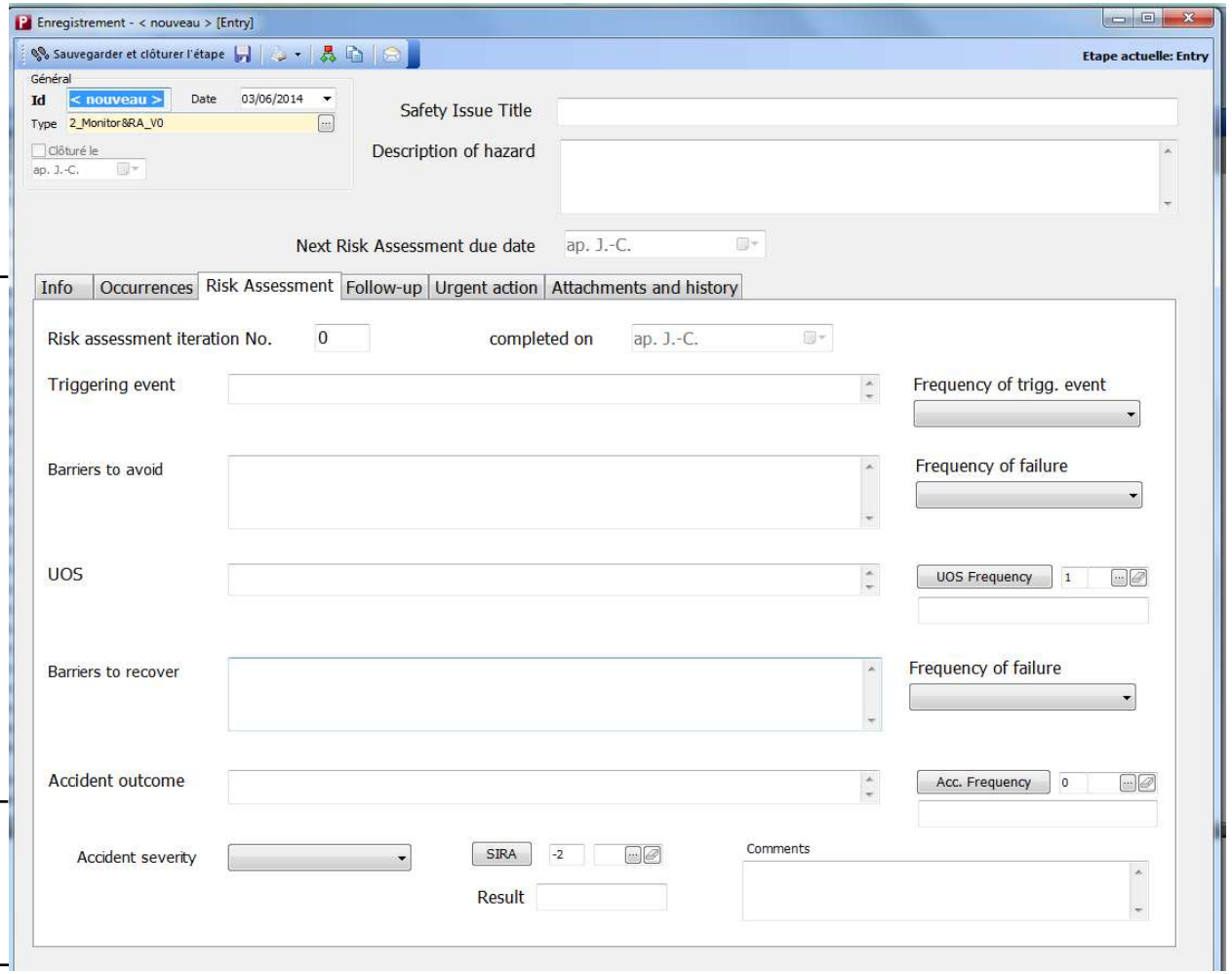
5. Software implementation

Safety Issue

Title
Date of next RA

Risk assessment:
- Triggering event
- Barriers to avoid
- UOS
- Barriers to recover
- Accident outcome

Accident severity
RA Outcome



6. Obstacles

Lessons learned - ERC:

1. « Calibration » is required
   Example: bird strike –
   no damage to aircraft

Effectiveness of remaining barriers?
Not effective ↓

Most credible accident outcome?
Minor injuries or damage →

50	102	502	2500
10	21	101	500
2	4	20	100
1			

ERC Risk Index = 100
Final outcome: Birdstrike as highest risk?

6. Obstacles

Lessons learned - SIRA:

1. « Scope » of a safety issue: not too narrow but not too wide
   - too narrow: no « repeat » occurrences, too many Safety Issues
   - too wide: impossible to do a risk assessment
     (too many triggering events,…)

     Examples:

   - ~~Aircraft flying wrong SID~~
     => Aircraft deviation from ATC clearance
   - ~~Runway incursion~~
     => Runway incursion by a person
     => Runway incursion by a vehicle
     => Runway incursion by an aircraft

6. Obstacles

Lessons learned - SIRA:

2. « Classification » of safety issues needed:

   – Structured « database » of safety issues

   – linking each occurrence to a safety issue:
   do we already have a safety issue like that?

   CICTT categories applied to safety issues

   …work in progress

6. Obstacles

Remaining limitiations:

ARMS Methodology:
Good information available for ERC and SIRA but not for…

- Managing a Safety Issue Database

Software:

- Linking an occurrence to safety issues: link to only 1 safety issue
- Data input – manual (with drop-down lists and tables)

Thank you for your attention!

Questions?