Risk Analysis Tool & Process (RAT/RAP)
The way the harmonise assessment of ATM incidents over EUROPE and FAA

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WORKSHOP ON IMPLEMENTATION OF THE ICAO SAFETY MANAGEMENT REQUIREMENTS IN STATES
Paris, France – 14/15 February 2011

ICAO Annex 13

- First edition September 1951
- 1st-3rd edition (04/1973) called “Aircraft Accident Inquiry”
- 4th-7th edition (05/1988) called “Aircraft Accident Investigation”
- 8th-9th edition (07/2001) called “Aircraft Accident and Incident Investigation”
ATM Safety reporting and investigation evolution in Europe

- ESARR 2 (ATM Occurrence Reporting and Investigation) and the first Risk Classification Scheme - 1999
- Risk Wizard – 2004/2005
- RAT – Risk Analysis Tool - 2009
- Implementing rule on Performance EC691/2010
European Regulatory environment change

• Need to know what occurs at European level
• States /ANSPs report to EUROCONTROL as of 1999
• EUROCONTROL to analyse the data
• Action Plans
• SESII, PRB, Performance framework

HARMONISATION

ESARR 2

Need to know about undesired events that have had or might have had an impact on safety

Reporting systems

Reported Safety Occurrences

Data collection
Analysis
Severity & Risk assessment
ATM contribution

Need to determine to what extent ATM has contributed to the occurrences and severity of a safety risk

Findings, Recommendations
Severity & Risk Assessment

Agreements (bilateral or regional)
Annual Summary Template

Need to share experiences

Trends, KRA, ATM improvements
GLOBAL SOLUTIONS

Requires a common TAXONOMY
Requires HARMONISED PROCESSES
Requires PROCEDURES CONFIDENTIAL ASSURANCE
Status in Europe back in 1999

- State shall ensure “that the severity of occurrences is determined, the risk posed by occurrences classified, and the results recorded.” (See ESARR 2 – section 5.1.6)

- The assessment/investigation of the occurrence shall enable the determination of the severity level of the occurrence (ESARR 2- A-3.1)

- EAM 2- GUI 1 states Supplementary material will be developed with experience to decrease the level of subjectivity inherent to severity assessment
Risk Classification Scheme for occurrences covering the capability to deliver safe ATM services (European version)

<table>
<thead>
<tr>
<th>Occurrence</th>
<th>D1</th>
<th>E1</th>
<th>C1</th>
<th>B1</th>
<th>A1</th>
<th>AA1</th>
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<tr>
<td>Frequent</td>
<td>D2</td>
<td>E2</td>
<td>C2</td>
<td>B2</td>
<td>A2</td>
<td>AA2</td>
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<td>E3</td>
<td>C3</td>
<td>B3</td>
<td>A3</td>
<td>AA3</td>
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<td>E4</td>
<td>C4</td>
<td>B4</td>
<td>A4</td>
<td>AA4</td>
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<tr>
<td>Very rare</td>
<td>D5</td>
<td>E5</td>
<td>C5</td>
<td>B5</td>
<td>A5</td>
<td>AA5</td>
</tr>
</tbody>
</table>

Not determined | No effect on ATM services | Ability to provide safe but degraded services | Partial inability to provide safe ATM services | Serious inability to provide safe ATM services | Total inability to provide safe ATM services

RAT and the performance IR EC691/2010

(2012-2014)

- The second European Union-wide safety key performance indicator shall be the percentage of application of the severity classification of Risk Analysis Tool as defined in Section 2, point 1(b) of the Regulation, to allow harmonised reporting of severity assessment of Separation Minima Infringements, Runway Incursions and ATM Specific Technical Events.

- The second national/FAB safety KPI shall be the application of the severity classification of the Risk Analysis Tool to allow harmonised reporting of severity assessment of Separation Minima Infringement, Runway Incursions and ATM Specific Technical Events at all Air Traffic Control Centres and airports with more than 150,000 commercial air transport movements per year within the scope of this Regulation (yes/no value).
Why RAT?

The RAT is a tool meant for:

- Service Providers – as part of their SMS (The ATS Unit Manager perspective: the safety performance of his unit)
- Regulators – as part of the Aviation-wide sector oversight (Representing the airline passenger perspective: how safe is it to travel by air)

Why Risk Analysis?

The Risk Analysis allows setting priorities:

- Repeatability
- Severity

- Do nothing
- Look into it
- May like/think to do something
- Urgent action
Risk Analysis Tool Aim

Ambition was to have a tool that is:

- Simple
- Easy to use
- Efficient/reliable (at least for 80/90% of cases)

Realism is that the tool:

- Will not provide the golden truth
- May not work well for complex incidents
- will still rely on experience and knowledge of experts

Tool principles

**Tool principles**

The tool computes proposed Risk Levels for both ATM and airports.

**A. ACCURACY**

**B. REPEATABILITY**

These results are based on answers to questions looking as much as possible at the facts, from investigation reports.
You can save comments or remarks about your selections.
- It’s limited to 250 characters.

Overall ATM and ATM
Ground Reliability
Indicators with colour
degraded progress bars

Click to open Causal / Contributing Factors
window

How does RAT work?

Separation
(V or H)
Rate of closure
(V or H)

RISK of COLLISION

CONTROLLABILITY

SEVERITY

SYSTEMIC & NON SYSTEMIC ISSUES

Window of opportunity

RISK
Where do the figures (used for computation) come from?

A large number of incidents were classified using expert judgement

Numbers used for computation could then be worked out (kind of reverse engineering)

Validation
A large number of incidents was used (same and then different from first set)

Group 1
NOT using RAT

Group 2
using RAT

Comparison and adjustments

Next incident(s)
Swap groups

Rules for organisation(s) SOP?

Tool limitations
Usage bias

Possible inconsistent results/data set

RULES & PROCEDURES

What will RAT be used for? ALL incidents? During and after investigation, only after?

Who will be entitled to use the tool? Experience and training requirements

Who will have the final word? Panel chair

Who will use the results and what for? Finding KRAs, trends and follow-up

How will a panel work? Consensus?

Etc...
**Rules for organisation(s) SOP – The FAA Example**

**Applicability**
The Risk Analysis Tool is to be applied to radar incidents involving two or more airborne aircraft with a Measure of Loss (MOL) of less than 66 percent. The tool contains separate spreadsheets for wake and non-wake events.

In order to prevent the introduction of inadvertent bias to Risk Analysis Tool values, data entry should be completed by a group of experts in possession of as much investigatory and factual information as possible.

**Risk Analysis Moderation Panel**
The Office of Quality Assurance will determine those events eligible for Risk Analysis, called Risk Analysis Events (RAEs), and will collect data for reliable analysis.

The panel will consist of three to five experts trained in the use of the tool. These experts will have diverse backgrounds from ATC, human factors, and/or flight operations.

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**Rules for organisation(s) SOP – The FAA Example**

**Panel Qualification and Currency**
There are multiple requirements for experts to participate on a Risk Analysis Moderation Panel, including experience, judgment, objectivity, and reliability. In addition, participants must have a clear understanding of the concept of risk as defined in this document and its application in the ATC environment;

**Nomination Process**
The Manager of Quality Assurance will nominate, in writing, candidates for panel participation. Nominations should include a brief summary of the characteristics and qualifications noted above and will be submitted to the Director of Quality Assurance, who will select appropriate candidates from the pool of nominees;

**Member Training and Currency**
To ensure quality and standardization, panel members must be properly trained and qualified. Once qualified, individuals are responsible for maintaining their currency requirements as detailed in this section. Panel members must notify the chair if their currency lapses;

In order to receive initial qualification as a Risk Analysis Moderation Panel member, candidates must:
- Read and become thoroughly familiar with the most current SOP and other documentation
- Attend a one-day training session conducted by the chair or his/her designee
- Serve at least three RAE analyses.
FAA FY 2010 non RAES vs RAES (Risk Analysis Events)

FY10 LoSS and RAES

- RAES: 19%
- Non RAES: 81%

FAA FY 2010 non RAES vs RAES (Risk Analysis Events) cont’d

FY10 Monthly RAE and LoSS count

Number of RAEs
Number of LoSS Events

October to September
November 26, 2010

- 552 Total Risk Analysis Events (RAEs) FY10
  365 were Operational Errors (OEs)
  187 were Pilot Deviations (PDs)

- 84 Total RAEs for FY11
  51 were Operational Errors (OEs)
  33 were Pilot Deviations (PDs)

Leading Causal/Contributing Factors
FAA Risk Assessment Results

Actual results of the 513 events reviewed (Nov 09 – Oct 10), using the ATO SMS risk matrix and risk assessment program jointly developed by FAA & EUROCONTROL.

Detailed analyses are triggered by a loss of separation greater than 34% of standard separation.

Serious Loss Event = High Risk Matrix Event (Red)

Sample of European ANSP Risk Assessment Results

Number of Separation Minima Infringements (Risk ATM GND) in RAT-Risk-Matrix

<table>
<thead>
<tr>
<th>Severity</th>
<th>high</th>
<th>low</th>
<th>not enough information</th>
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<tr>
<td>31-30</td>
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<td>B</td>
<td>C</td>
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<tr>
<td>30-17</td>
<td>D</td>
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<td></td>
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<tr>
<td>10-0</td>
<td>F</td>
<td>G</td>
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<tr>
<td>0-0</td>
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<table>
<thead>
<tr>
<th>Repetitability</th>
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<tr>
<td>0-1</td>
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</tr>
<tr>
<td>1-2</td>
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</tr>
<tr>
<td>2-3</td>
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</tr>
<tr>
<td>3-4</td>
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<td>1</td>
</tr>
<tr>
<td>4-5</td>
<td>5</td>
<td>2</td>
<td>2</td>
</tr>
</tbody>
</table>

SMI ATM GND total: 226
SMI GND total: 51

SMS Workshop – ICAO Paris, France 14-15 Feb 2011
**FAA Initial results - Issues Identified using RAT**

- OJTI performance
- ATC recovery methods
- RNAV procedures and mitigation strategies
- Misapplication of Visual Separation
- Turns to Final

**Causal Factors Watch List**

- Controller recovery actions to address immediate aircraft conflicts
  - 41% involved ATC recovery issues
  - 55% of the recovery weighted events were poor
  - Out of the most severe RAE 87% involve ATC recovery issues
  - Most severe score: 5/5
Causal Factors Watch List

- Turns to final (same altitude on parallel turn-ons, poor vectoring techniques, etc.)
  - 5% of RAE

- On-the-Job Training instructor performance
  - 10% of RAEs
  - Most severe score: 5/3

Causal Factors Watch List

- PDs and mitigation designs for simultaneous Area Navigation (RNAV) departure applications
  - 13% of PD RAEs
  - Most severe score: 4/3

- Misapplication of Visual Separation
  - 9% of RAEs
  - Most severe score: 4/3
Top Five Causal Contributing Factors

- A2-1. Forgot to monitor
- D3-9. Controller / pilot under training
- D6-14. Lack of personal perception of risk
- A3-2. Incorrect decision / plan

FAA Top 5 Pilot Causal Contributing Factors

- B1-2. Correct pilot readback followed by incorrect action
- B1-9. Failed to follow ATC procedure
- A2-1. Forgot to monitor
- B1-6. CRM issues
- B2-2. Pilot failed to / or slow to respond
What are the advantages of RAT?

RAT provides for:

- A means to reduce subjectivity
- Harmonisation
- Transparency
- Easier communication/discussion
- Quick process
- Works as “push” to enhance investigation
- Provide hard facts in backing up Recommendation for improvement – see Recovery example

Thanks for your attention