ICAOs SMS and the HAM Safety and Health Approach

- ICAOs Safety Management System
- Proposal for a Reporting System
- Accident and incident cadaster...
- Limits of method
ICAO Annex 14, chapter 1.3 supported by ICAO Manual on certification of aerodromes (Doc 9774)

1.3.6 As of 24. November 2005, a certified aerodrome shall have in operation a Safety Management System (SMS).

Doc9774 / 3.2 Section C: AERODROME MANUAL- It contains all the pertinent information concerning the aerodrome site, facilities, services, equipment, operating procedures, organisation and management including the safety management system.
**Definition: safety management system**

(according to ICAO Doc 9774 AN/969 Manual on Certification of Aerodromes)

is a system for the management of safety at aerodromes including the

- organizational structure,
- responsibilities,
- procedures,
- processes and
- provisions

for the implementation of *aerodrome safety policies* by an aerodrome operator, which provides for the control of safety at, and the safe use of, the aerodrome.
Safety management system

The aim of the SMS

Operational Safety improved by

Minimizing risks
Avoiding "safety events"
Minimizing the effects (monetary and operational) of "safety events"
Fulfilling safety standards of regulations and laws

s. ADV proposal
According to ADV (German Airport Association) a suitable reporting system to collect, analyze and spread safety data must be established. It contains:

- **Definition of safety aims** and assessment of progresses
- **Documentation of accidents/incidents** including internal/external results of investigation and initiated correction measures
- **Statistical analysis** to show developments and tendencies
- Results of security checks and **recommendation of correction measures**
- **Documentation of safety events**, training courses and measures
- All doubts, assessments and resulting adjustments concerning safety
- Analysis of developments and findings
Following instruments should be the basis for SMS reporting:

- Establishment of an Airport Safety Committee
- Publication of Safety Bulletins
- Training measures
- Safety campaigns
- Exchanges of information
- Safety information available by intranet etc.
- Establishment of an airportwide reporting system to notify accidents/incidents and safety doubts
- Cooperation with institutions of science and research
- Collection of specialist journals and statute books
airportwide reporting system

example:
accident/incident cadaster at HAM:

- Data collection
  - accident/incident report
  - safety barometer
  - ACI-report
- Visualize happening accidents/incidents
- Discover accident/incident emphasisses
It contains the following types:

- not notifiable work accidents
- notifiable work accidents
- accidents / incidents with moving aircraft
- accidents / incidents with stationary aircraft
- damage by jet blast
- equipment to equipment damage
- equipment to facility damage
- damage to container / freight
Accident/incident cadaster at HAM
To connect accidents/incidents on an aerodrome with flight movements we established an emphasis rate (SPZ).

\[ \text{SPZ} = \frac{\text{accidents/incidents} \times 1000}{\text{arrivals} + \text{departures}} \]
Analysis of damage 2003
August 2003

Accident/incident emphasis cadaster 2003 (DAMAGE - accident/incident emphasises with a minimum of two incidents)

<table>
<thead>
<tr>
<th>Pos.</th>
<th>No. of arrivals</th>
<th>No. of departures</th>
<th>Difference</th>
<th>Description of position</th>
<th>No. of accidents/incidents</th>
</tr>
</thead>
<tbody>
<tr>
<td>17</td>
<td>2176</td>
<td>2347</td>
<td>-171</td>
<td>Apron 1</td>
<td>4</td>
</tr>
<tr>
<td>19</td>
<td>1700</td>
<td>1837</td>
<td>-137</td>
<td>Apron 1</td>
<td>1</td>
</tr>
<tr>
<td>16</td>
<td>2117</td>
<td>2289</td>
<td>-172</td>
<td>Apron 1</td>
<td>2</td>
</tr>
<tr>
<td>20</td>
<td>1492</td>
<td>1634</td>
<td>-142</td>
<td>Apron 1</td>
<td>2</td>
</tr>
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<td>13</td>
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<td>2090</td>
<td>-199</td>
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<td>2</td>
</tr>
<tr>
<td>42</td>
<td>3972</td>
<td>3985</td>
<td>-13</td>
<td>Apron 1</td>
<td>2</td>
</tr>
</tbody>
</table>

Reinhard Fingerle
Accident/incident cadaster at HAM
### Accident/incident cadaster at HAM

#### Analysis of work accidents 2003

**Accident/incident emphasis cadaster 2003 (WORK ACCI-/INCIDENTS - acci-/incident emphasises with a minimum of two incidents)**

<table>
<thead>
<tr>
<th>Pos.</th>
<th>No. of arrivals</th>
<th>No. of departures</th>
<th>Difference</th>
<th>Description of position</th>
<th>No. of accidents/incidents</th>
<th>29</th>
<th>16</th>
</tr>
</thead>
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<tr>
<td>585</td>
<td>50</td>
<td>30</td>
<td>20</td>
<td>Apron 2</td>
<td>1 1 0 0 2</td>
<td>25</td>
<td></td>
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<tr>
<td>71</td>
<td>1113</td>
<td>1119</td>
<td>-6</td>
<td>Apron 1</td>
<td>1 1 1 0.45 2</td>
<td>0.9</td>
<td></td>
</tr>
<tr>
<td>64</td>
<td>1.807</td>
<td>1.767</td>
<td>40</td>
<td>Apron 1</td>
<td>1 1 0 0.0 2</td>
<td>0.56</td>
<td></td>
</tr>
<tr>
<td>15</td>
<td>2124</td>
<td>2284</td>
<td>-160</td>
<td>Apron 1</td>
<td>1 2 1 0.23 2</td>
<td>0.45</td>
<td></td>
</tr>
</tbody>
</table>
Comparison of strategies in risk assessment

Retrospective analysis:
+ Good practice
+ Ensured mishap - data base
+ Return on investment more easy
- "Shit happened before"

Prospective Analysis:
- Looking for "the needle in a haycock"
- Needs a standardized scale to estimate the hazards - when found
- Return on investment is difficult
+ No one was injured / nothing destroyed
### Retrospective safety / risk rates described by IATA, ACI, HAM

<table>
<thead>
<tr>
<th>IATA-Guidelines for a Safety Management System (Ramp Inci-/Accident Report AHM 693 Risk Activity Assessment AHM 683)</th>
<th>ACI- Apron Safety Handbook (ground incident / accident reporting and analysis procedures)</th>
<th>Target rates at Hamburg Airport</th>
</tr>
</thead>
</table>
| **“Damage Rate”**  
The Frequency of damage to aircraft on the apron expressed in terms of number of occurrences per 1,000 departures for one given carrier.  

**“Safety Level”**  
The number of incidents / accidents per 1,000 aircraft movements is a measurement of apron safety at any particular airport.  
The average of incident / accident rates from ACI worldwide (Data for every ACI-category) or respective region (total of ACI-categories) may be taken as a reference level.  

The **ACI - “Safety Level”** with Data for the full year in EUR-region for airports with more than 70,000 annual Aircraft movements is our reference level.  
To picture apron high risk areas we use an incident / accident (sum of all ACI-categories) rate per 1,000 aircraft-movements on each stand - so called **“Emphasis Rate -SPZ”**. |
Risk assessment: Establishing target levels of safety

Ideally, zero risk is the target level for operational safety.

In practice there has to be a quantitative target level of safety.
Prospective safety / risk rates described by IATA, ACI, HAM

<table>
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<th>ACI- Apron Safety Handbook (Ground Incident / Accident reporting and analysis procedures)</th>
<th>target rate developed at Hamburg Airport</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>„Mishap Probability”</strong>&lt;br&gt;The result of a procedure to identify and estimate the hazards associated with the operations or tasks around the aircraft.&lt;br&gt;The method is based on a two-dimensional matrix (like the so-called risk graph) with Hazard Probability and Hazard Severity which guides to a number.&lt;br&gt;The appropriate risk assessment code leads you to priorities to reform operations to get safer processes.</td>
<td>?</td>
<td><strong>„Accident Hazard Measure - Gm”</strong>&lt;br&gt;The result of a procedure to identify and estimate the hazards for all operations at the airport.&lt;br&gt;The method is based on a modified FMEA (Failure Mode and Effect Analysis).&lt;br&gt;( Gm ) is the product from Hazard Probability and Hazard Severity.&lt;br&gt;The appropriate risk assessment code leads you to priorities to reform operations to get safer processes.</td>
</tr>
</tbody>
</table>
Example for prospective risk assessment at HAM

1. Work out the accident hazard rate „Gm“ by safety auditing of operations

2. The appropriate risk assessment code leads you to priorities to reform operations and get more safer processes

estimated hazard: Infection by HAV (Hepatitis-A-Virus) caused of contact with the faeces by cleaning up the Aircraft

„F“-Severity: (worst case) 2
4 to 8 week clinical inhabitation

„W“-Probability: 1
by looking at the way of descent

„Gm“ Accident hazard measure: 2x1
2 leads to take “desirable” action (e.g. Face-shield) to protect the employees

1. Work out the accident hazard rate „Gm“ by safety auditing of operations

2. The appropriate risk assessment code leads you to priorities to reform operations and get more safer processes
Practical retrospective risk assessment at HAM with ACI safety level

Look for differences between the ACI-EUR and HAM survey and work out the causes of accident / incident in the different sectors of ground operations

<table>
<thead>
<tr>
<th>ACI-Report (Data for full Year)</th>
<th>Year</th>
<th>2001</th>
<th>2000</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>ACI-EUR (&gt;70,000 AC-movements)</td>
<td>HAM</td>
</tr>
<tr>
<td>Aircraft movements</td>
<td></td>
<td>ACI</td>
<td>HAM</td>
</tr>
<tr>
<td>participating Airports</td>
<td></td>
<td>23,098,966</td>
<td>7,522,149</td>
</tr>
<tr>
<td>No of incidents/accidents, of which:</td>
<td></td>
<td>353</td>
<td>40</td>
</tr>
<tr>
<td>Incidents/accidents involving aircraft</td>
<td></td>
<td>8,591</td>
<td>0,4</td>
</tr>
<tr>
<td>Incidents/accidents involving Equip. &amp; facilities</td>
<td></td>
<td>1,826</td>
<td>0,1</td>
</tr>
<tr>
<td>Equip. &amp; facilities</td>
<td></td>
<td>6,765</td>
<td>0,3</td>
</tr>
</tbody>
</table>
Safety barometer at HAM

Acci-/incidents according to sum of ACI-Categories A, B, C per 1000 flight movements

A: Damage to moving aircraft
B: Equipment to facility damage
C: Damage by jet blast

Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec

Safety barometer at HAM

HAM-Airport-Group: Work accidents
1000 - employees - quote

Reinhard Fingerle
Retrospective analysis:
- For better assessment with a safety level according to ACI, data for the EUR-region in detailed categories would be helpful!

Prospective analysis:
Especially to analyse the return on investment more standardized data were needed for costs of:
- damage to aircraft
- operational consequences
- damage to handling equipment
- injury to personnel!
The end?

Thank you
Runway Safety is no accident

Runway Safety is no accident

European Action Plan for the prevention of Runway Incursions

www.eurocontrol.int/runwayincursions