Safety Management System in Air Traffic Services

presented by David Cheung
Civil Aviation Department, Hong Kong, China
Content

- Air Traffic Services
- Safety Management System – Why?
- SMS Implementation in ATS by HK CAD
- Conclusion
Air Traffic Services

Aims

- Prevent collisions
- Orderly and expeditious flow
- Advice & information for safe and efficient conduct of flights
- Search and Rescue
Air Traffic Services

- Air Traffic Control Service (ATC)
- Flight Information Service
- Alerting Service

provided by

Air Traffic Management Division
Civil Aviation Department
Aerodrome Control Tower
Air Traffic Control Centre
Safety Management System - Why?

International Civil Aviation Organization

ICAO SARPs Requirements

States
- Safety Programme
- Acceptable Level of Safety

Service Providers
- ATS Provider
- Aircraft Operators
- Maintenance Organizations
- Aerodrome Operators
- Safety Management System
Safety Management System - Why?

Harmonization of safety standards in using new technologies

Satellite Datalink
Automated Systems, etc
CNS/ATM

Communication

Navigation

Surveillance

Air Traffic Management
Safety Management System - Why?

Is Flying Safe?
2003 Aircraft Accidents

Hull Loss/Substantial Damage: 91

Fatal: 27

2015: ?
Scope of SMS in ATS

- ALARP
- Hazards within ATS
Implementation work started in 2001

- define safety policy and principles
- safety management course for senior ATCO
- induction presentations to all ATC staff on Safety and Quality Management
- identify Owners of Safety Management Procedures (viz Documents)
- establishment of a Quality Assurance post
  - coordinate SMS activities
- develop Safety Management Procedures
ATMD

Safety Management Policy Manual

• Issued in April 2002

Approved by Assistant Director-General of Civil Aviation (ATM)
Owned by Chief ATCO (Safety, Quality and Development)

- Safety Policy
- Safety Objectives
- Accountabilities & Responsibilities
- Safety Management Procedures
ATMD Safety Policy

• Minimizing Risks ALARP –
  *Safety has First Priority*

• Clear lines of Accountability & Responsibility
  *Everyone is responsible for safety*

• Promoting Safety Culture through Training
  *Continuous Improvement*

• Ensuring safety policy implementation and
  *Compliance to SARPS and procedures*

• Ensuring externally supplied products and services meet ATMD S&Q requirements
Safety Objectives

• **Goal**

Maintain the highest level of safety as far as reasonably practicable when providing air traffic services

• **Means**

Maintain a safety system and culture that encourages safety improvement and effective communication about safety issues

• **Equipment & System**

Define, introduce, maintain and operate equipment and systems in a controlled, standardized and safe manner according to relevant ICAO Standards and Recommended Practices, Divisional safety cases, operating procedures, and instructions.
• Involvement & Training
• Safety Assessment
• Investigations Documentation
• Supervision
• Safety & Quality Audits
• Accountabilities & Responsibilities
• Regular Reviews
ATMD
Safety Management Procedures

• Safety Control Procedures

• Safety Assurance Procedures

• Safety Promotion Procedures
Safety Control Procedures

- Safety Level Monitoring
- Training, Licensing, Examination and Competency
- Document & Record Control
- Human Factors
- Emergency & Crisis Management
- Safety-Related Technical Systems
Safety Assurance Procedures

- Risk Assessment & Management
- Safety Assessment
- Internal Auditing
- Incident Investigation
Safety Promotion Procedures

• Safety-Related Information
• Staff Safety Suggestion
• Lessons Learnt
Publication of Procedures

- Manuals, Handbooks, etc
Safety Control Publications

- “Acceptable Level of Safety”
- Human Factors Training Programme
- Emergency & Contingency Procedures Manual
- Document and Record Control procedure
- Recruitment Manual
- Training Unit Operations Manual
- Personnel Licensing Handbook
- Quick Reference Material Handbook
- Aeronautical Information Service Quality Manual
- Operational Instruction
Safety Assurance Publications

- Safety Assessment Guidance Manual
- Auditor Handbook
Safety Promotion Publications

- ATMD Staff Suggestion Scheme
- Safety Information
- Lessons Learnt
- Occurrence Report Database
CAD's Safety Regulatory Oversight

Air Traffic Management Standards Office (ATMSO)

established in March 2003
ATMSO’s Tasks

- Establish the ATM services safety regulatory framework based on statutory requirements
  - AN(HK)O & ICAO SARPs
  - consultation with concerned parties
- Oversight of ATS SMS development
- Administer the ATC Licensing System – ATC competency assurance
• Define ATM Services Safety Regulatory Objectives, Requirements and Standards
  Document CAD670

• Review/Amend Air Navigation (HK) Order

• Conduct ATM services safety oversight - monitoring, assessments, audits, inspections

• Participate in ATC accident/incident investigations
Acceptable Level of Safety (ALOS) and Safety Monitoring of ATS Operations

- Establishment of ALOS and Safety Objectives
  - ICAO Annex 11 requirements

- There is no such thing as absolute safety
  Acceptable level of safety = Acceptable level of risk

- Level of risk is the product of:
  Probability of occurrence (P) x Severity of consequence (S)
## Risk Classification Scheme
### ATC Operations

<table>
<thead>
<tr>
<th>Probability of Occurrence per flight</th>
<th>Severity Category</th>
</tr>
</thead>
<tbody>
<tr>
<td>Qualitative</td>
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</tr>
<tr>
<td>Frequent</td>
<td>Ps &gt; 10^{-3}</td>
</tr>
<tr>
<td>Probable</td>
<td>10^{-3} &gt; Ps &gt; 10^{-4}</td>
</tr>
<tr>
<td>Occasional</td>
<td>10^{-4} &gt; Ps &gt; 10^{-5}</td>
</tr>
<tr>
<td>Remote</td>
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### Acceptability Indicators

- A = Unacceptable
- B = Undesirable, may exceptionally be acceptable but only with the endorsement of ADG(ATM) and ADG(FS)
- C = Acceptable upon review, with the endorsement of ADG(ATM)
- D = Acceptable
Categories of Risk Level

- Unacceptable
- The In-Betweens (ALARP)
  - consideration needs to be given to the various tradeoffs between risks and benefits
- Acceptable
Categories of Risk Level

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ALARP – As Low As Reasonably Practicable
Application of Acceptable Level of Safety (ALOS)

Examples of ATS aspects where ALOS is applicable

- A maximum probability of loss of separation
- A maximum probability of runway incursion
- A maximum number of valid short-term conflict alerts (STCA) per hour per ATC sector
ATS ALOS Classification Scheme

ATS ALOS Classification

Probability of Occurrence per Flight

- ALOS for AIRPORX with endorsement of ADG(ATM), upon review
- ALOS for AIRPORX subject to special endorsement by both ADG(ATM) & ADG(FS)
- ALOS for OD with endorsement of ADG(ATM), upon review
- ALOS for OD subject to special endorsement by both ADG(ATM) & ADG(FS)
- ALOS for TI with endorsement of ADG(ATM), upon review
- ALOS for TI subject to special endorsement by both ADG(ATM) & ADG(FS)

ATMD
SEP 2004
More specific safety targets (ALOS) can be set, using the matrix:

- Level bust
- Unauthorized track deviation
- Wrong transfer level
- Failure of ATC radar display
- Failure of ATC communication system
Monitoring by trained safety and standard officers

and

Use of mathematical models
can go hand-in-hand
What if risk data exceeds ALOS?

Loss of Separation (AIRPROX) Risk in Area Control

12-Month Moving Occurrence Rate

Probability of Occurrence per Flight

• ALOS for AIRPROX with endorsement of ADG(ATM), upon review
• ALOS for AIRPROX subject to special endorsement by both ADG(ATM) & ADG(FS)

AIRPROX - An occurrence when both horizontal and vertical separations between aircraft are less than 50% of the required standards.

(Hypothetical Data)
Action to be considered

- Large scale retraining
- Airspace re-structuring
- Introduction of more rigid procedures
- More system redundancy
- Additional traffic flow control measures
- Review & Adjust the ALOS
Conclusion

- Commitment
- Proactive Safety Culture
- User Friendly
- Consultation with Users
- Training in SMS
- Just Culture
- Regulatory Oversight
- Development Training
Thank You