PANS Aerodromes Chapter 3: Safety Assessments

Workshop for the Implementation of procedures for initial aerodrome certification and continuing aerodrome safety oversight, Aerodrome compatibility studies

June 26-29, 2018

Fabio Salvatierra De Luca
AGA Regional Officer
South American Regional Office
International Civil Aviation Organization

Objective:

- Help users undertake the safety assessment required in Chapters 2 and 4 of the PANS-Aerodromes.

How:

- It outlines the methodologies and procedures, including a list of topics to be followed when undertaking a safety assessment in the specific domain of aerodromes.

Note: It also includes references to and complements Annex 19 and Doc 9859, *Safety Management Manual (SMM)* which, respectively, provide the high-level safety management responsibilities and processes, and generic safety management guidance

Safety Assessments for Aerodromes

- 3.1.1 A certified aerodrome operator implements an SMS acceptable to the State that, as a minimum.
  a) identifies safety hazards;
  b) ensures that remedial action necessary to maintain safety is implemented;
  c) provides for continuous monitoring and regular assessment of the achieved safety; and
  d) aims to make continuous improvement to the overall safety of the aerodrome.

- Chapter 3 of Doc 9981 describes how a safety assessment can be undertaken as part of the aerodrome's SMS.
- By applying the methodology and procedures described in this chapter, **the aerodrome operator can demonstrate compliance** with the minimum requirements described in the previous slide.

Annex 19 - Safety Management contains the framework for the implementation and maintenance of an SMS by a certified aerodrome.

Appendix 1 to Chapter 2 of Doc. 9981 lists minimum items to be in place when granting the initial certification

Chapter 3:

- Section 3.4: how the State will validate the conclusion of the safety assessment, when appropriate, to ensure safety is not compromised.
- Section 3.5: procedures on the approval or acceptance of a safety assessment.
- Section 3.6: specifies how to promulgate appropriate information for use by the various aerodrome stakeholders and particularly by the pilots and aircraft operators

Basic Considerations

General considerations on safety assessments

- For SARPS deviations
- Changes (procedures, equipment, infrastructure, operations, regulations, organization, etc.)
- Consider stakeholders

Items that may need to be considered when conducting an safety assessment:

- aerodrome layout;
- types of aircraft intended to operate at the aerodrome;
- traffic density and distribution;
- aerodrome ground services;
- air ground communications;
- type and capabilities of surveillance systems;
- flight instrument procedures and related aerodrome equipment;
- complex operational procedures - CDM;
- aerodrome technical installation - A-SMGCS;
- obstacles or hazardous activities at or in the vicinity of the aerodrome;
- planned construction or maintenance;
- any local or regional MET conditions;
- airspace complexity.

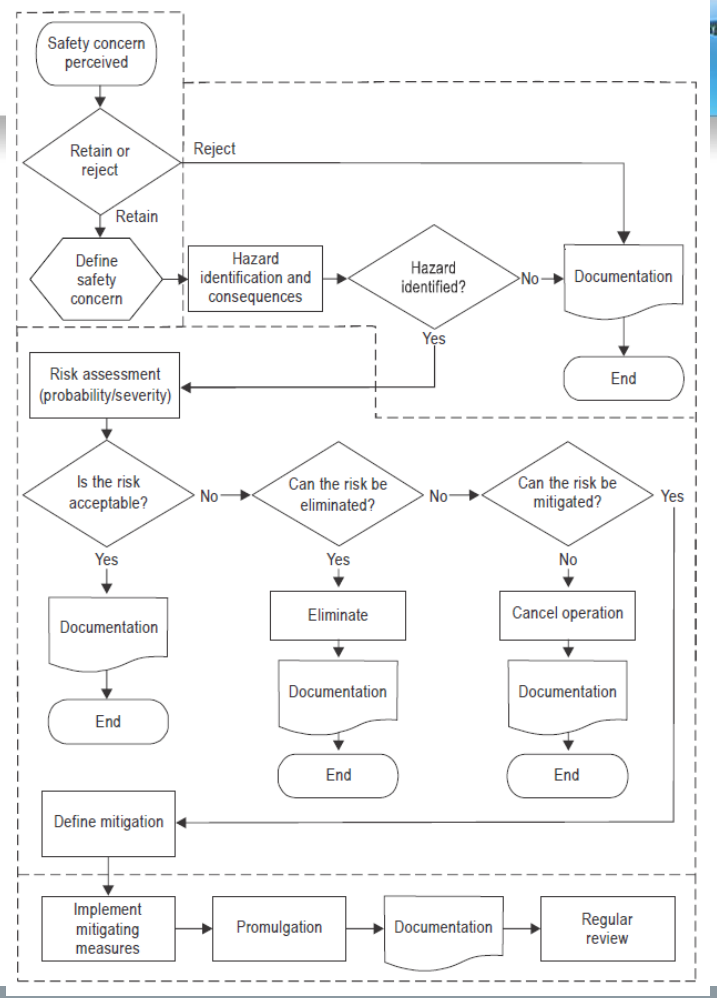
3.4 Safety assessment process

a. definition of a safety concern and identification of the regulatory compliance;

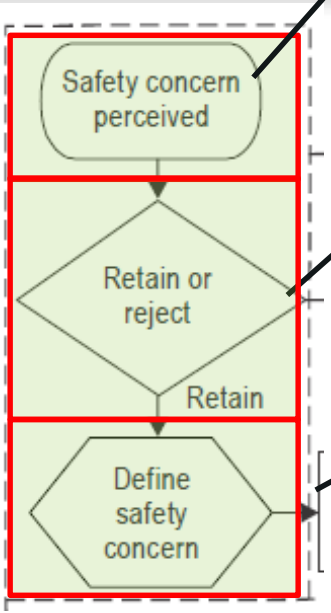
b. hazard identification and analysis;

c. risk assessment and development of mitigation measures; and

d. development of an implementation plan for the mitigation measures and conclusion of the assessment.



1. Definition of a safety concern and identification of the regulatory compliance



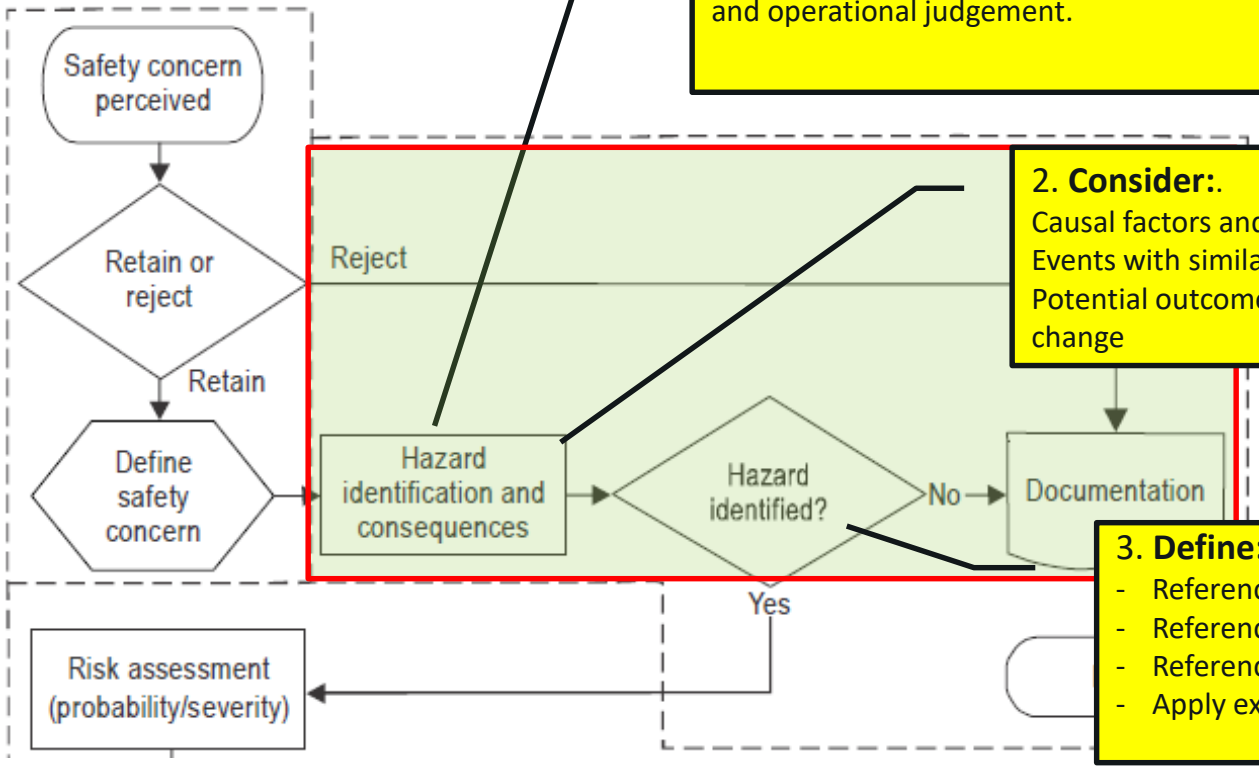
1. **Describe in detail:** Include timescales, Projected phases, Location, Stakeholders involved/affected & influence, Procedures & operations

2. **Evaluate the safety concern:** to determine if retain or reject.
If reject (no safety concern), just Document.
Compliance with regulations applicable

3. **Identify:** areas of concern with all relevant stakeholder before proceeding

Note.— It may be useful to review the historical background of some regulatory provisions to gain a better understanding of the safety objective of those provisions. Elements from similar cases in the same context may be used, but with care.

2. Hazard Identification



1. **Identify:** brainstorming, expert opinion, industry knowledge, experience and operational judgement.

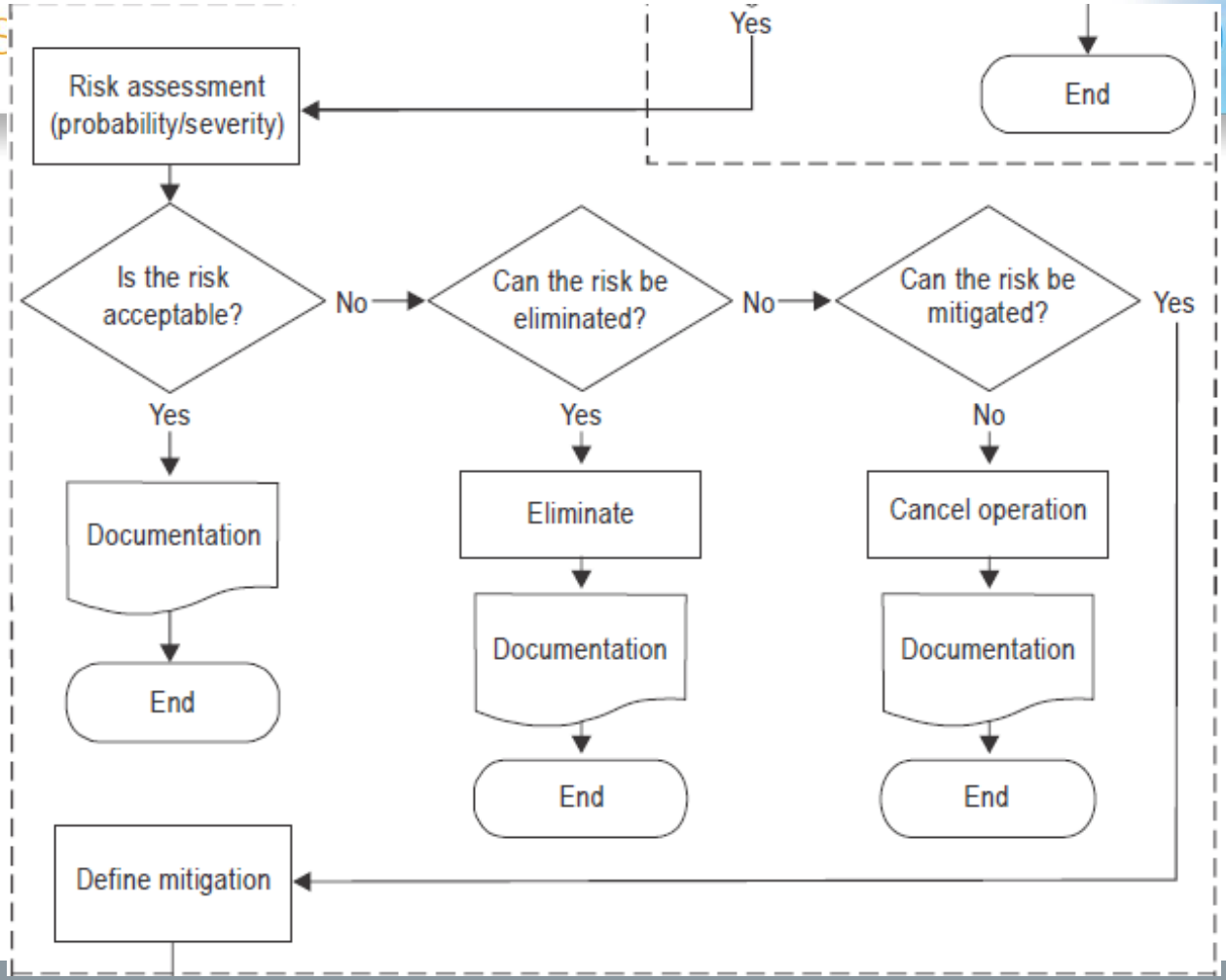
2. **Consider:**.
Causal factors and critical events
Events with similar circumstances
Potential outcomes/new hazards after change

3. **Define:** safety objective
- Reference to standards
- Reference to existing safety performance
- Reference acceptance to similar system elsewhere
- Apply explicit safety risk level

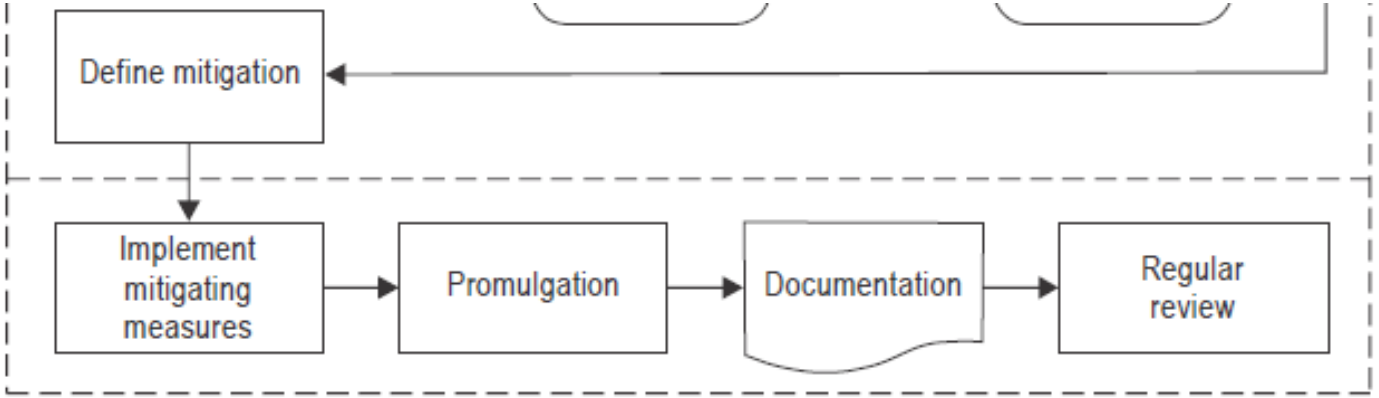
3. Risk assessment and development of mitigation measures

- Estimate the level of risk of each identified potential consequence by conducting a risk assessment and determine the severity of a consequence and probability of the consequence occurring
- The method for risk evaluation is dependent on the nature of the hazards. The risk itself is evaluated by combining the two values for **severity** of its consequences and **probability** of occurrence

Note.— A risk categorization tool in the form of a safety risk (index) assessment matrix is available in Doc 9859.


Yes
End
Risk assessment (probability/severity)
Is the risk acceptable?
No
Can the risk be eliminated?
No
Can the risk be mitigated?
Yes
Yes
Yes
No
Documentation
Eliminate
Cancel operation
Documentation
Documentation
End
End
End
Define mitigation

5. Development of an implementation plan and conclusion of the assessment



- The implementation plan includes time frames, responsibilities for mitigation measures as well as control measures that may be defined and implemented to monitor the effectiveness of the mitigation measures

RISK MATRIX EXAMPLE-INCHEON AIRPORT

Severity table-Incheon Airport

Number	Severity	Loss	Meaning
5	Very High	Human Loss	Casualties are more than 10 people
		Hardware Loss	More than 10 million dollars
		Operational Loss	Airport Close or airport operation suspension
4	High	Human Loss	Casualties are 1 to 9 people
		Hardware Loss	More than 1 million and less than 10 million dollars
		Operational Loss	Runway close: more than 24 H, txiway and apron close: more than 72 h
3	Moderate	Human Loss	Serious Injuries to be hospitalized
		Hardware Loss	More than 100,000 and less than 1 million dollars
		Operational Loss	Runway close: more than 12 H, txiway and apron close: less than 72 h
2	Low	Human Loss	Light injuries more than 4 weeks medical treatment
		Hardware Loss	More than 10,000 and less than 100,000 dollars
		Operational Loss	Aircraft Operational Delay 3 H or Aircraft operaion cancel
1	Very Low	Human Loss	Light injuries less than 4 weeks medical treatment
		Hardware Loss	less than 10,000 dollars
		Operational Loss	No effect airport operation

Probability table- Incheon Airport

Number	Probability	Meaning
5	Very High	It is expected to happen in a month
4	High	It is expected to happen in a year
3	Moderate	It is expected to happen in 5 years
2	Low	It is expected to happen in 20 years
1	Very Low	It is expected don't happen in 20 years

Risk Matrix-Incheon Airport

Severity / Probability	Very High 5	High 4	Moderate 3	Low 2	Very Low 1
Very High 5	Very High (25)	Very High (20)	High (15)	High (10)	Moderate (5)
High 4	Very High (20)	Very High (16)	High (12)	Moderate (8)	Moderate (4)
Moderate 3	High (15)	High (12)	High (9)	Moderate (6)	Low (3)
Low 2	High (10)	Moderate (8)	Moderate (6)	Moderate (4)	Low (2)
Very Low 1	Moderate (1)	Moderate (5)	Low (3)	Low (2)	Low (1)

https://www4.icao.int/demo/SMI/Risk_matrix.pdf

Criteria table-Incheon Airport

Level of risk		Acceptability of risk	Criteria for management
16~25	Very high	Intolerable	It is required to be eliminated or reduced to be less than middle risk
9~15	High	Tolerable	It is required to be eliminated or reduced to be less than middle risk
4~8	Middle		It is acceptable, but further action is required
1~3	Low	Acceptable	no further action is required

APPROVAL OR ACCEPTANCE OF SAFETY ASSESSMENT

Not everything…

The State establishes the type of safety assessments that are subject to approval or acceptance and determines the process used for that approval/acceptance.

What to analyze/verify?

a. Coordination with stakeholders
b. Risks properly identified and assessed based on documented arguments (physical or HF studies, previous accident analysis, etc.)
c. Acceptable implementation time frames

What after?

On completion of the analysis of the safety assessment, the State:

a. either gives formal approval or acceptance of the safety assessment to the aerodrome operator; or

b. if some risks have been underestimated or have not been identified, coordinates with the aerodrome operator to reach an agreement on safety acceptance; or

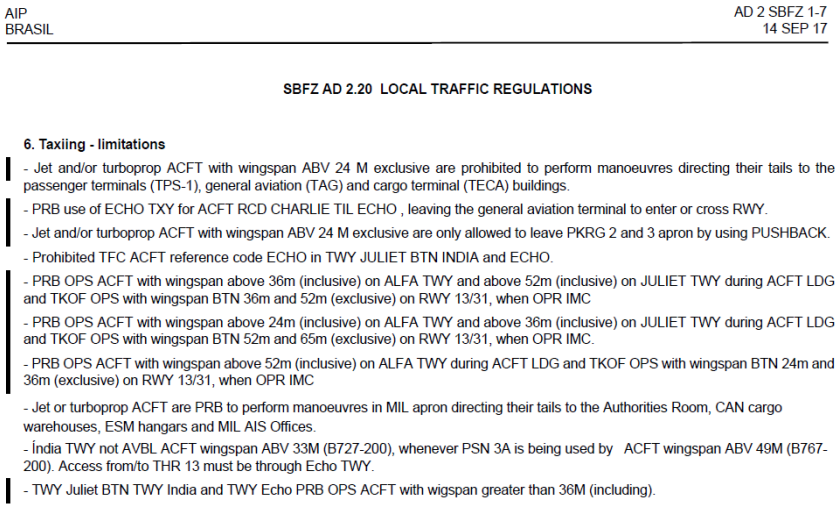
c. if no agreement can be reached, rejects the proposal for possible resubmission by the aerodrome operator; or

d. may choose to impose conditional measures to ensure safety.

The State should ensure that the mitigation or conditional measures are properly implemented and that they fulfil their purpose.

Promulgation of Safety Information

- The aerodrome operator determines the most appropriate method for communicating safety information to the stakeholders
- Must ensure that all safety-relevant conclusions of the safety assessment are adequately communicated.
- In case the information affects current integrated aeronautical information package (IAIP), promulgate on IAIP or ATIS



AIP
BRASIL

AD 2 SBFZ 1-7
14 SEP 17

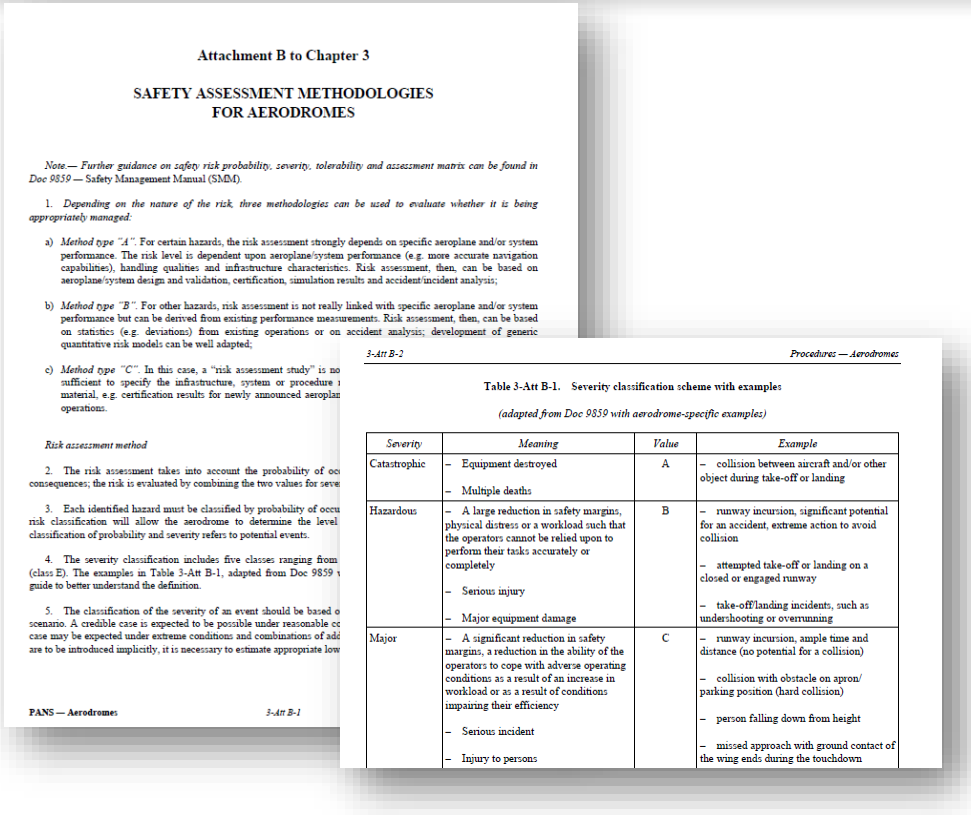
SBFZ AD 2.20 LOCAL TRAFFIC REGULATIONS

6. Taxiing - limitations

- Jet and/or turboprop ACFT with wingspan ABV 24 M exclusive are prohibited to perform manoeuvres directing their tails to the passenger terminals (TPS-1), general aviation (TAG) and cargo terminal (TECA) buildings.
- PRB use of ECHO TXY for ACFT RCD CHARLIE TIL ECHO , leaving the general aviation terminal to enter or cross RWY.
- Jet and/or turboprop ACFT with wingspan ABV 24 M exclusive are only allowed to leave PKRG 2 and 3 apron by using PUSHBACK.
- Prohibited TFC ACFT reference code ECHO in TWY JULIET BTN INDIA and ECHO.
- PRB OPS ACFT with wingspan above 36m (inclusive) on ALFA TWY and above 52m (inclusive) on JULIET TWY during ACFT LDG and TKOF OPS with wingspan BTN 36m and 52m (exclusive) on RWY 13/31, when OPR IMC
- PRB OPS ACFT with wingspan above 24m (inclusive) on ALFA TWY and above 36m (inclusive) on JULIET TWY during ACFT LDG and TKOF OPS with wingspan BTN 52m and 65m (exclusive) on RWY 13/31, when OPR IMC.
- PRB OPS ACFT with wingspan above 52m (inclusive) on ALFA TWY during ACFT LDG and TKOF OPS with wingspan BTN 24m and 36m (exclusive) on RWY 13/31, when OPR IMC
- Jet or turboprop ACFT are PRB to perform manoeuvres in MIL apron directing their tails to the Authorities Room, CAN cargo warehouses, ESM hangars and MIL AIS Offices.
- Índia TWY not AVBL ACFT wingspan ABV 33M (B727-200), whenever PSN 3A is being used by ACFT wingspan ABV 49M (B767-200). Access from/to THR 13 must be through Echo TWY.
- TWY Juliet BTN TWY India and TWY Echo PRB OPS ACFT with wigspan greater than 36M (including).

Attachment B to Chapter 3

Attachment B to Chapter 3 offers safety assessment methodology tailored to aerodromes



Attachment B to Chapter 3

SAFETY ASSESSMENT METHODOLOGIES FOR AERODROMES

Note.— Further guidance on safety risk probability, severity, tolerability and assessment matrix can be found in Doc 9859 — Safety Management Manual (SMM).

1. *Depending on the nature of the risk, three methodologies can be used to evaluate whether it is being appropriately managed:*

a) *Method type "A".* For certain hazards, the risk assessment strongly depends on specific aeroplane and/or system performance. The risk level is dependent upon aeroplane/system performance (e.g. more accurate navigation capabilities), handling qualities and infrastructure characteristics. Risk assessment, then, can be based on aeroplane/system design and validation, certification, simulation results and accident/incident analysis;

b) *Method type "B".* For other hazards, risk assessment is not really linked with specific aeroplane and/or system performance but can be derived from existing performance measurements. Risk assessment, then, can be based on statistics (e.g. deviations) from existing operations or on accident analysis; development of generic quantitative risk models can be well adapted;

c) *Method type "C".* In this case, a "risk assessment study" is no
sufficient to specify the infrastructure, system or procedure
material, e.g. certification results for newly announced aeroplan
operations.

Risk assessment method

2. The risk assessment takes into account the probability of occ
consequences; the risk is evaluated by combining the two values for seve

3. Each identified hazard must be classified by probability of occu
risk classification will allow the aerodrome to determine the level
classification of probability and severity refers to potential events.

4. The severity classification includes five classes ranging from
(class E). The examples in Table 3-Att B-1, adapted from Doc 9859
guide to better understand the definition.

5. The classification of the severity of an event should be based o
scenario. A credible case is expected to be possible under reasonable co
case may be expected under extreme conditions and combinations of add
are to be introduced implicitly, it is necessary to estimate appropriate low

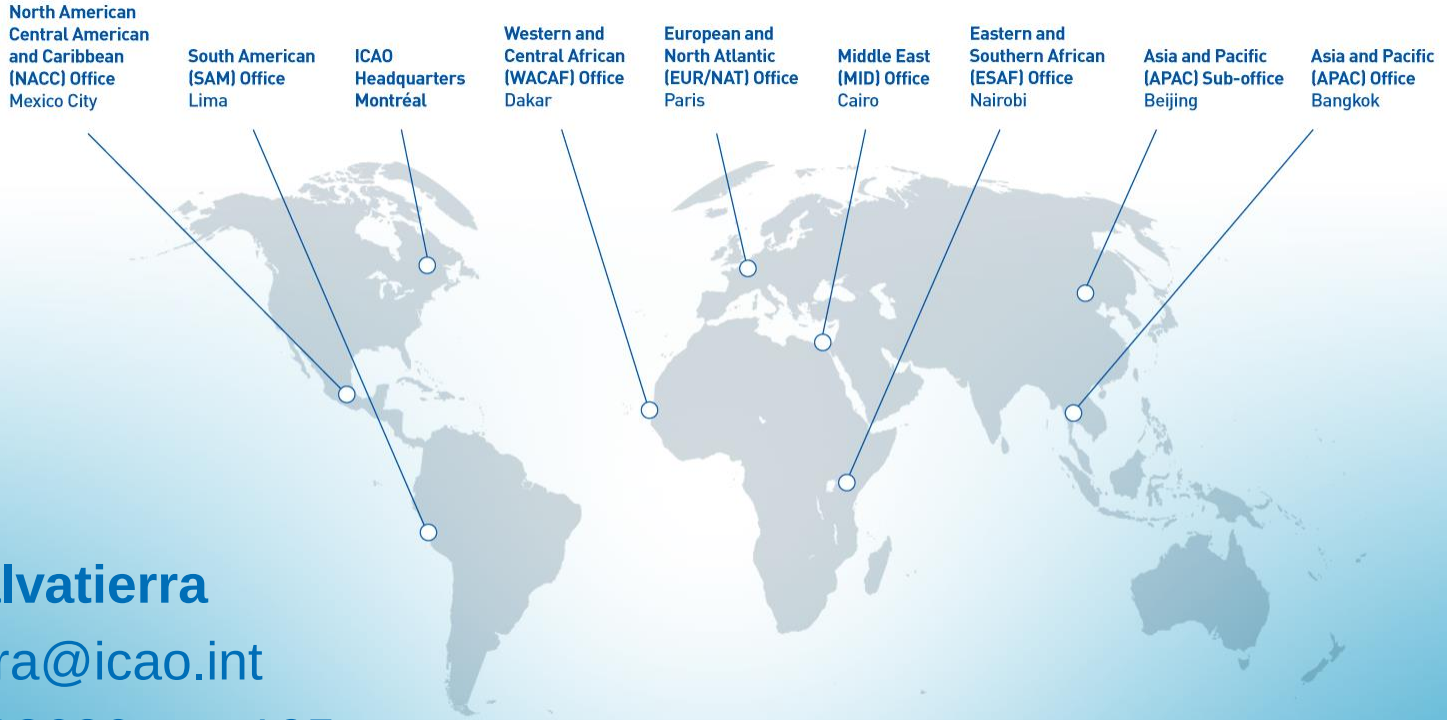
PANS — Aerodromes 3-Att B-1

3-Att B-2 *Procedures — Aerodromes*

Table 3-Att B-1. Severity classification scheme with examples

(adapted from Doc 9859 with aerodrome-specific examples)

Severity	*Meaning*	*Value*	*Example*
Catastrophic	– Equipment destroyed – Multiple deaths	A	– collision between aircraft and/or other object during take-off or landing
Hazardous	– A large reduction in safety margins, physical distress or a workload such that the operators cannot be relied upon to perform their tasks accurately or completely – Serious injury – Major equipment damage	B	– runway incursion, significant potential for an accident, extreme action to avoid collision – attempted take-off or landing on a closed or engaged runway – take-off/landing incidents, such as undershooting or overrunning
Major	– A significant reduction in safety margins, a reduction in the ability of the operators to cope with adverse operating conditions as a result of an increase in workload or as a result of conditions impairing their efficiency – Serious incident – Injury to persons	C	– runway incursion, ample time and distance (no potential for a collision) – collision with obstacle on apron/ parking position (hard collision) – person falling down from height – missed approach with ground contact of the wing ends during the touchdown



Fabio Salvatierra
fsalvatierra@icao.int
+51 1 6118686 ext. 105