ICAO UNITING AVIATION

PANS Aeródromos Capítulo 3: Evaluaciones de Seguridad Operacional

Seminario Taller OACI CAR/SAM sobre Certificación de Aeródromos para Reguladores y Operadores

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Fabio Salvatierra De Luca
Oficial Regional AGA
Oficina Sudamericana
Organización de Aviación Civil Internacional

Objetivo del Capt. 3:

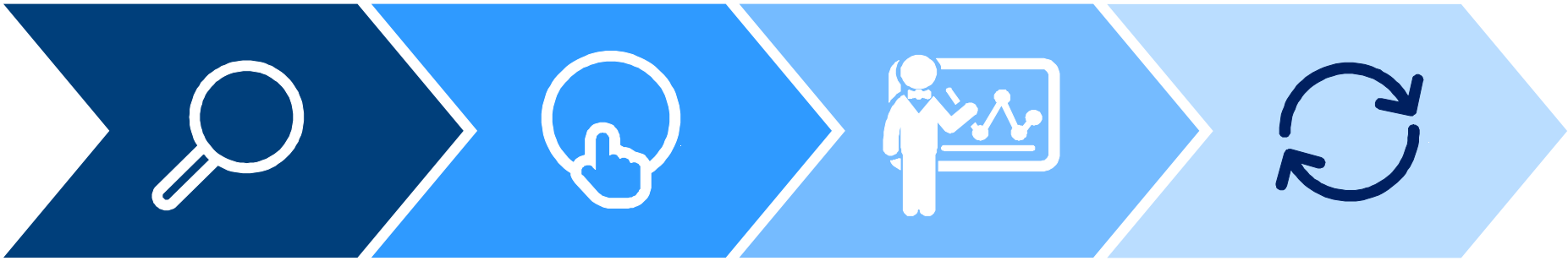
- Ayudar a los usuarios a llevar a cabo las evaluaciones de seguridad operacional requeridas en los capítulos 2 y 4 del PANS Aeródromos.

¿Cómo?:

- Describe metodologías y procedimientos, incluyendo una lista de temas a ser analizados cuando se realizan análisis de seguridad operacional en el caso especifico de los aeródromos.

Nota: también incluye referencias y complementos al Anexo 19 y el Doc 9859 *Manual de Seguridad Operacional*, que, respectivamente, proveen las responsabilidades de alto nivel en seguridad operacional, y los procesos y guías genéricas para un sistema de seguridad operacional.

SMS aceptable al Estado que como mínimo:



IDENTIFICA

- identifica los peligros para la seguridad operacional

APLICA

- garantiza que se apliquen las medidas correctivas necesarias para mantener la seguridad operacional

CONTROL

- Cuenta con disposiciones para el control permanente y la evaluación periódica de la seguridad op. alcanzada

MEJORA

- Procura la mejora continua de la seguridad operacional general del aeródromo.

Capt. 3, 3.1.1

- El Capitulo 3 del Doc 9981 describe como una evaluación de seguridad operacional se realiza **como parte del SMS del aeródromo**.
- Al aplicar la metodología y procedimientos descritos en este capitulo, **el operador del aeródromo puede demostrar cumplimiento** con los requerimientos minimos establecidos anteriormente.

El Anexo 19 — Gestión de la seguridad operacional, *contiene un marco para la implantación y el mantenimiento de un SMS por un aeródromo certificado.*

Los componentes mínimos del SMS que deben estar operativos antes de que se otorgue el certificado figuran en el Apéndice 1 del Capitulo 2 del Documento 9981.

Secciones claves del Capítulo 3

- Sección 3.4: se detalla la forma en que el Estado validará la conclusión de la evaluación de la seguridad operacional, si procede, a fin de garantizar que dicha seguridad no se ha visto comprometida.
- Sección 3.5: procedimientos para la aprobación o aceptación de una evaluación de la seguridad operacional.
- Sección 3.6: especifica el modo de promulgar la información apropiada para el uso por las diversas partes interesadas del aeródromo y, en particular, los pilotos y explotadores de aeronaves

AIRPORT COUNCIL INTERNATIONAL

CONSIDERACIONES Y PROCESO DE EVALUACIÓN SEGÚN PANS

Safety assessment in aerodromes

Safety assessment in aerodromes

The safety assessment process addresses the ***impact of a safety concern, including a change or deviation, on the safety of operations at the aerodrome and takes into consideration the aerodrome's capacity and the efficiency of operations,*** *as necessary.*

Safety assessment in aerodromes

A safety assessment **is an element of the risk management process of an SMS that is used to assess safety concerns** arising from, inter alia, deviations from standards and applicable regulations, identified changes at an aerodrome specified, or when any other safety concerns arise.

When a safety concern, change or a deviation **has an impact on several aerodrome stakeholders, consideration shall be given to the involvement of all stakeholders affected in the safety assessment process**.

In some cases, **the stakeholders impacted by the change will need to conduct a separate safety assessment themselves in order to fulfil the requirements of their SMSs** and coordinate with other relevant stakeholders.

Safety assessment in aerodromes

When a change has an impact on multiple stakeholders, a collaborative safety assessment should be conducted to ensure compatibility of the final solutions.

A safety assessment considers the impact of the safety concern on **all relevant factors determined to be safety-significant.**

Safety assessment in aerodromes

The items in this list are not exhaustive and in no particular order:

a) **aerodrome layout**, including runway configurations; runway length; taxiway, taxilane and apron configurations; gates; jet bridges; visual aids; and the RFF services infrastructure and capabilities;

b) **types of aircraft**, and their dimensions and performance characteristics, intended to operate at the aerodrome;

c) **traffic** density and distribution;

d) **aerodrome ground services**;

e) **air-ground communications** and time parameters for voice and data link communications;

Safety assessment in aerodromes

f) **type and capabilities of surveillance systems** and the availability of systems providing controller support and alert functions;

g) **flight instrument procedures** and related aerodrome equipment;

h) **complex operational procedures**, such as collaborative decision-making (CDM);

i) **aerodrome technical installations**, such as advanced surface movement guidance and control systems (A-SMGCS) or other air navigation aids;

j) **obstacles or hazardous activities** at or in the vicinity of the aerodrome;

k) **planned construction or maintenance works** at or in the vicinity of the aerodrome;

Safety assessment in aerodromes

l) any **local or regional hazardous meteorological conditions** (such as wind shear); and

m) **airspace complexity**, ATS route structure and classification of the airspace, which may change the pattern of operations or the capacity of the same airspace.

Subsequent to the completion of the safety assessment, **the aerodrome operator is responsible for implementing and periodically monitoring the effectiveness of the identified mitigation measures**.

The State reviews the safety assessment provided by the aerodrome operator and its identified mitigation measures, and is responsible for the subsequent regulatory oversight of their application.

Safety assessment process

The primary objective of a safety assessment is to **assess the impact of a safety concern such as a design change or deviation in operational procedures** at an existing aerodrome.

Such a **safety concern can often impact multiple stakeholders**; therefore, **safety assessments often need to be carried out in a cross-organizational manner**, involving experts from all the involved stakeholders.

Prior to the assessment, a **preliminary identification of the required tasks and the organizations** to be involved in the process is conducted.

Safety assessment process

A safety assessment is initially composed of four basic steps:

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.

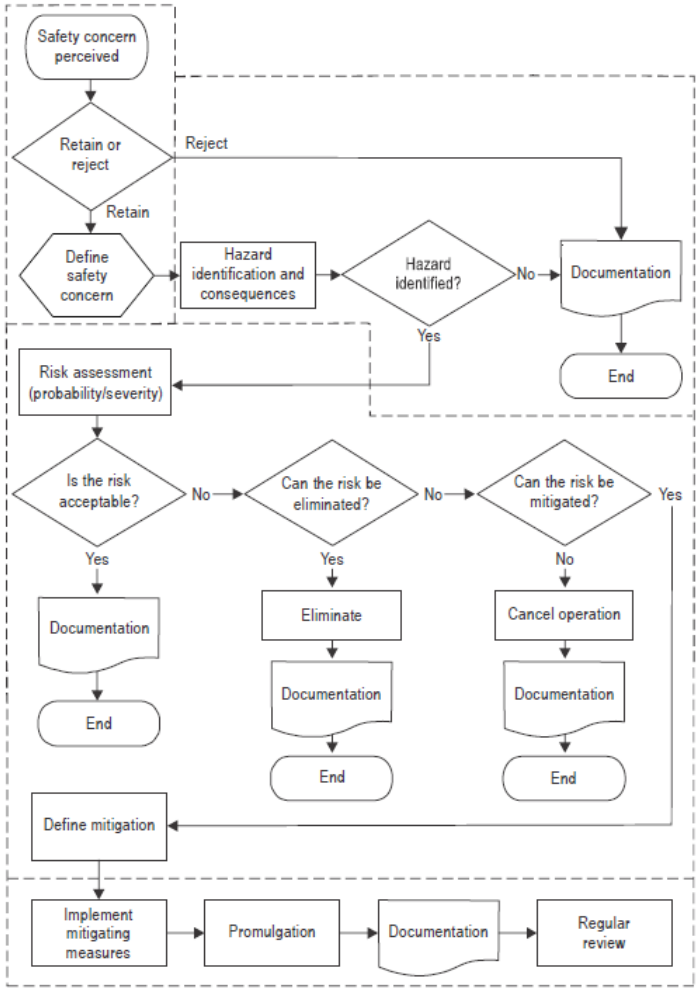


Figure 3-Att A-1. Flow chart to be used for the conduct of a safety assessment

Safety concern/identification of regulatory compliance

Any perceived safety concerns must be described in **detail, including timescales, projected phases, location, stakeholders involved or affected as well as their potential influence on specific processes, procedures, systems and operations**.

The perceived safety concern **is first analysed to determine whether it is retained or rejected**.

If rejected, the justification for rejecting the safety concern is to be provided and documented.

An **initial evaluation of compliance** with the appropriate provisions in the regulations applicable to the aerodrome is conducted and documented.

Safety concern/identification of regulatory compliance

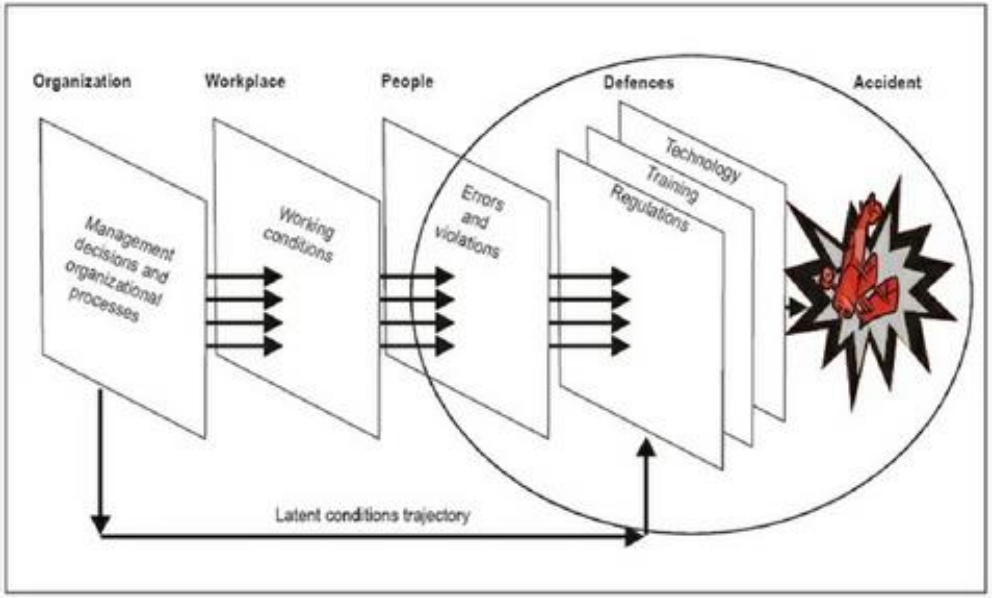
The **corresponding areas of concern are identified before proceeding with the remaining steps of the safety assessment**, with all relevant stakeholders.

If a safety assessment was conducted previously for similar cases in the same context at an aerodrome where similar characteristics and procedures exist, **the aerodrome operator may use some elements from that assessment as a basis for the assessment to be conducted**.

Nevertheless, as **each assessment is specific to a particular safety concern** at a given aerodrome the suitability for reusing specific elements of an existing assessment is to be carefully evaluated.

Hazard identification

Hazards related to infrastructure, systems or operational procedures are initially identified using methods such as **brain-storming sessions, expert opinions, industry knowledge, experience and operational judgement**.



The identification of hazards is conducted by considering:

a) **accident causal factors and critical events** based on a simple causal analysis of available accident and incident databases;

Hazard identification

b) **events that may have occurred in similar circumstances** or that are subsequent to the resolution of a similar safety concern; and

c) **potential new hazards that may emerge during or after implementation of the planned changes**.

Hazard identification

Following the previous steps, all potential outcomes or consequences for each identified hazard are identified.

The appropriate safety objective for each type of hazard should be defined and detailed.

This can be done through:

a) **reference to recognized standards** and/or codes of practices;

b) **reference to the safety performance** of the existing system;

c) **reference to the acceptance of a similar system elsewhere**; and

d) **application of explicit safety risk levels**.

Hazard identification

Safety objectives are specified in either **quantitative terms** (e.g. identification of a numerical probability)or **qualitative terms** (e.g. comparison with an existing situation).

The selection of the safety objective is made **according to the aerodrome operator's policy with respect to safety improvement and is justified for the specific hazard**.

Risk assessment and development of mitigation measures

The **level of risk** of each identified potential consequence is estimated by **conducting a risk assessment**.

This **risk assessment will determine the severity of a consequence** (effect on the safety of the considered operations) **and the probability of the consequence** occurring and will be based on experience as well as on any available data (e.g. accident database, occurrence reports).

Understanding the risks is the basis for the **development of mitigation measures, operational procedures and operating restrictions** that might be needed to ensure safe aerodrome operations.

Risk assessment and development of mitigation measures

The method for risk evaluation is strongly 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**.

Once each hazard has been identified and analysed in terms of causes, and assessed for severity and probability of its occurrence, it **must be ascertained that all associated risks are appropriately managed**.

An **initial identification of existing mitigation measures** must be conducted **prior to the development of any additional measures**.

All risk mitigation measures, whether currently being applied or still under development, **are evaluated for the effectiveness of their risk management capabilities**.

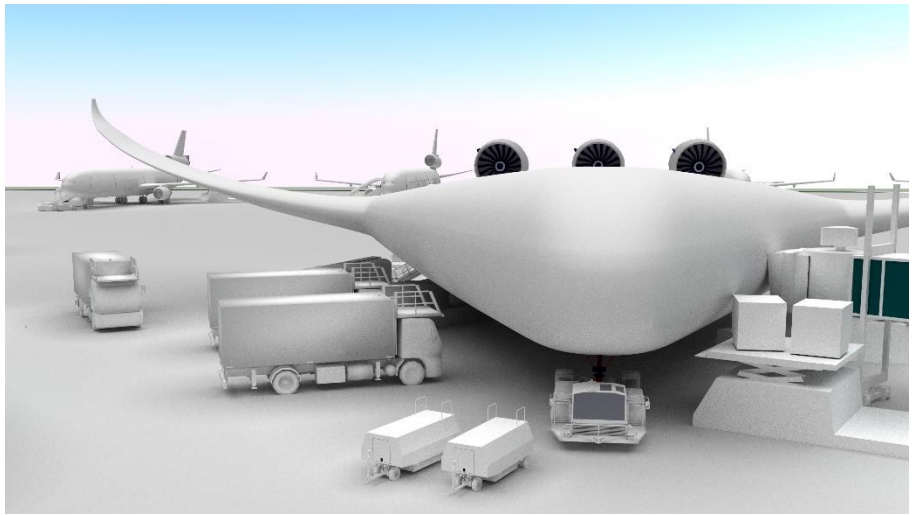
Risk assessment and development of mitigation measures

In some cases, a **quantitative approach** may be possible, and numerical safety objectives can be used.

In other instances such as **changes to the operational environment or procedures**, a qualitative analysis may be more relevant.

States should provide suitable guidance on risk assessment models for aerodrome operators.

In some cases, the result of the risk assessment may be that the safety objectives will be met without any additional specific mitigation measures.



Implementation plan and conclusion of the assessment

The last phase of the safety assessment process is the **development of a plan for the implementation of the identified mitigation measures**.

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

Safety assessment methodologies for aerodromes

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**;

Safety assessment methodologies for aerodromes

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 not needed**.

A simple logical argument may be sufficient to specify the infrastructure, system or procedure requirements, without waiting for additional material, e.g. **certification results for newly announced aeroplanes or using statistics from existing aeroplane operations**.

Risk assessment method

The risk assessment takes into account the **probability of occurrence of a hazard and the severity of its consequences**; the risk is evaluated by **combining the two values for severity and probability of occurrence**.

Each identified hazard must be **classified by probability of occurrence and severity of impact**.

This process of risk classification will **allow the aerodrome to determine the level of risk posed by a particular hazard**.

The classification of probability and severity refers to **potential events**.

Risk assessment method

The severity classification includes five classes ranging from **“catastrophic” (class A) to “not significant” (class E).**

The classification of the severity of an event should be based on a “**credible case**” but not on a “worst case” scenario.

A credible case is **expected to be possible under reasonable conditions** (probable course of events). A worst case may be expected under extreme conditions and combinations of additional and improbable hazards.

If worst cases are to be introduced implicitly, it is necessary to **estimate appropriate low frequencies**.

Risk probability		Risk severity				
		Catastrophic A	Hazardous B	Major C	Minor D	Negligible E
Frequent	5	5A	5B	5C	5D	5E
Occasional	4	4A	4B	4C	4D	4E
Remote	3	3A	3B	3C	3D	3E
Improbable	2	2A	2B	2C	2D	2E
Extremely improbable	1	1A	1B	1C	1D	1E

Risk assessment method

The classification refers to the **probability of events per a period of time**. This is reasoned through the following:

a) many hazards at aerodromes are **not directly related to aircraft movements**; and

b) the assessment of hazards occurrence probabilities can be **based on expert judgement without any calculations**.

The aim of the matrix is to provide a **means of obtaining a safety risk index**.

Likelihood	*Meaning*	*Value*
Frequent	Likely to occur many times (has occurred frequently)	5
Occasional	Likely to occur sometimes (has occurred infrequently)	4
Remote	Unlikely to occur, but possible (has occurred rarely)	3
Improbable	Very unlikely to occur (not known to have occurred)	2
Extremely improbable	Almost inconceivable that the event will occur	1

Risk assessment method

The index can be used to determine **tolerability of the risk and to enable the prioritization** of relevant actions in order to decide about risk acceptance.

Given that the prioritization is dependent on both probability and severity of the events, **the prioritization criteria will be two-dimensional**.

Table Att-4. Risk index matrix (severity × likelihood)

Likelihood	*Severity*				
	1. Insignificant	*2. Minor*	*3. Moderate*	*4. Major*	*5. Catastrophic*
A. Certain/frequent	Moderate (1A)	Moderate (2A)	High (3A)	Extreme (4A)	Extreme (5A)
B. Likely/occasional	Low (1B)	Moderate (2B)	Moderate (3B)	High (4B)	Extreme (5B)
C. Possible/remote	Low (1C)	Low (2C)	Moderate (3C)	Moderate (4C)	High (5C)
D. Unlikely/improbable	Negligible (1D)	Low (2D)	Low (3D)	Moderate (4D)	Moderate (5D)
E. Exceptional	Negligible (1E)	Negligible (2E)	Low (3E)	Low (4E)	Moderate (5E)

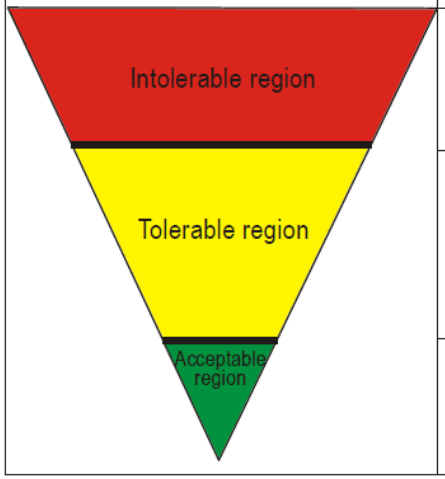
Risk assessment method

Three main classes of hazard mitigation priority are defined:

a) hazards with **high priority — intolerable**;

b) hazards with **mean priority — tolerable**; and

c) hazards with **low priority — acceptable**.

Tolerability description	Assessed risk index	Suggested criteria
	**5A, 5B, 5C, 4A, 4B, 3A**	Unacceptable under the existing circumstances
	5D, 5E, 4C, 4D, 4E, 3B, 3C, 3D, 2A, 2B, 2C, 1A	Acceptable based on risk mitigation. It may require management decision.
	3E, 2D, 2E, 1B, 1C, 1D, 1E	Acceptable

Risk assessment method

The risk assessment matrix has no fixed limits for tolerability but points to a floating assessment where risks are given risk priority for their risk contribution to aircraft operations.

For this reason, the priority classes are intentionally not edged along the probability and severity classes in order to take into account the imprecise assessment.

Table Att-5. Risk acceptability (tolerability) table

Risk Index	*Tolerability*	*Action required (customize as appropriate)*
5A, 5B, 4A	Extreme risk	Stop operation or process immediately. Unacceptable under the existing circumstances. Do not permit any operation until sufficient control measures have been implemented to reduce the risk to an acceptable level. Top management approval required.
5C, 4B, 3A	High risk	Caution. Ensure that risk assessment has been satisfactorily completed and declared preventive controls are in place. Senior management approval of risk assessment before commencement of the operation or process.
1A, 2A, 2B, 3B, 3C, 4C, 4D, 5D, 5E	Moderate risk	Perform or review risk mitigation as necessary. Departmental approval of risk assessment.
1B, 1C, 2C, 2D, 3D, 3E, 4E	Low risk	Risk mitigation or review is optional.
1D, 1E, 2E	Negligible risk	Acceptable as is. No risk mitigation required.

APROBACIÓN O ACEPTACIÓN DE UNA EVALUACIÓN DE LA SEGURIDAD OPERACIONAL

No todas…

- El Estado establece el tipo de evaluaciones de la seguridad operacional que están sujetas a aprobación o aceptación y determina el proceso empleado para dicho fin.

Qué se analiza?

a) las partes interesadas correspondientes hayan establecido una **coordinación apropiada**;

b) se hayan identificado y evaluado correctamente los riesgos, sobre la base de argumentos documentados (e.g., estudios físicos o de FH, análisis de accidentes e incidentes previos);

c) las medidas de mitigación propuestas solucionen el riesgo de forma adecuada;

d) los plazos de la implantación planificada sean aceptables.

Y después de la evaluación?

Al finalizar el análisis de la evaluación de la seguridad operacional, el Estado:

a) aprueba o acepta formalmente la evaluación de la seguridad operacional del explotador de aeródromo; o

b) si se han subestimado o no se identificaron algunos riesgos, establece una coordinación con el explotador de aeródromo a fin de llegar a un acuerdo respecto de la aceptación de la seguridad operacional; o

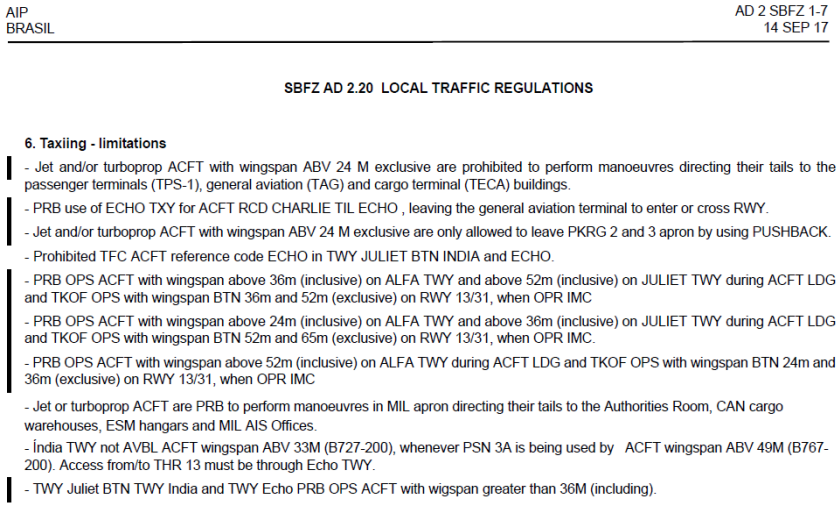
c) si no se logra un acuerdo, rechaza la propuesta, que posiblemente el explotador de aeródromo vuelva a presentar; o

d) puede decidir imponer medidas condicionales para garantizar la seguridad operacional.

3.5.5 - El Estado debería velar por que las medidas condicionales o de mitigación se implanten de forma apropiada y cumplan su finalidad.

Promulgación de información relativa a la seguridad operacional

- El explotador de aeródromo determina el método más apropiado para comunicar información relativa a la seguridad operacional a las partes interesadas
- Se asegura de que todas las conclusiones importantes para la seguridad operacional se comuniquen de forma adecuada.
- La información que afecta a la documentación integrada de información aeronáutica (IAIP) actual u otra información pertinente **en materia de seguridad operacional** debería promulgarse en el **AIP y/o servicio automático de información terminal (ATIS)**



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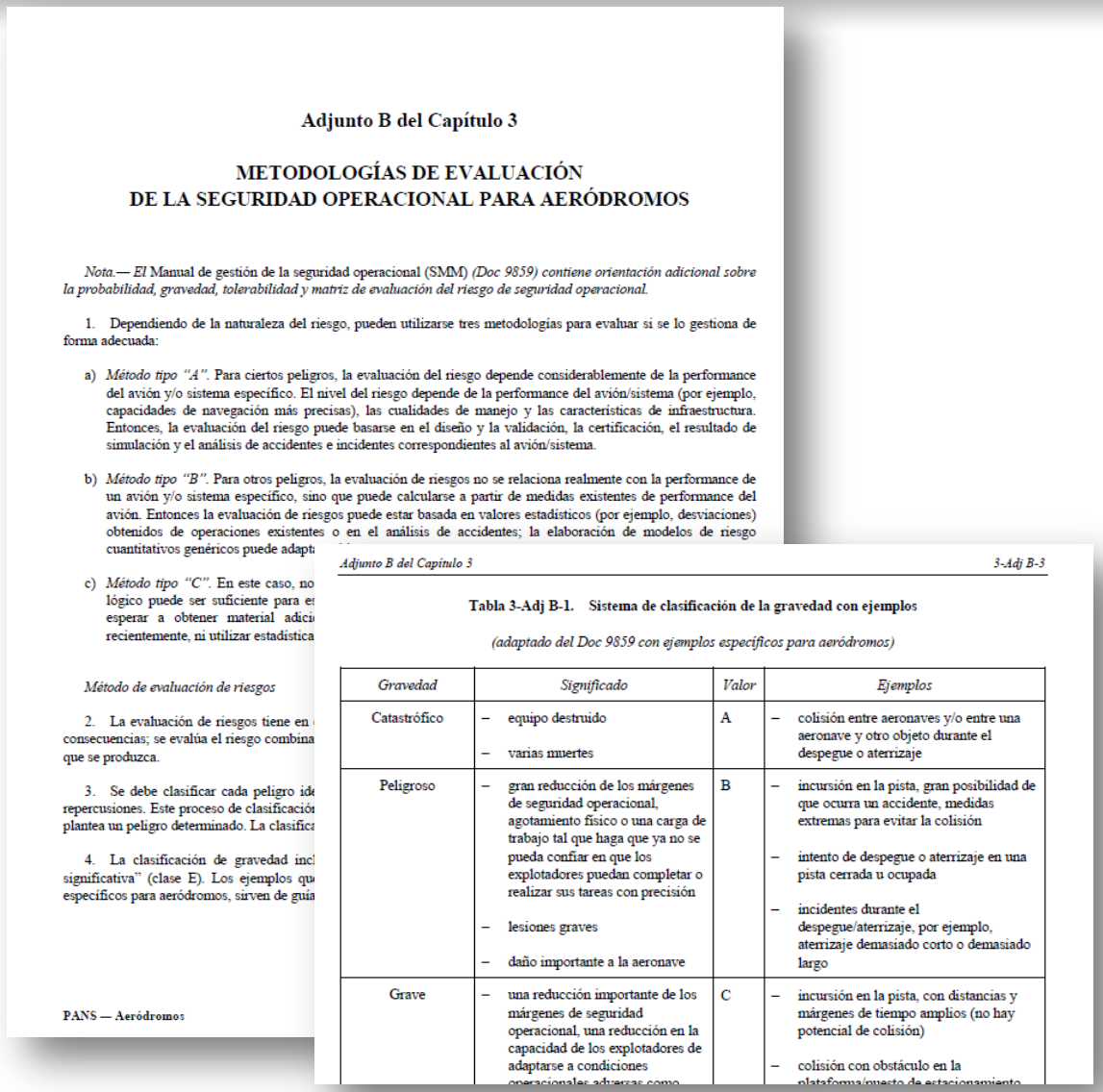
SBFZ AD 2.20 LOCAL TRAFFIC REGULATIONS

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).

Adjunto B al Capítulo 3

El adjunto B del Capítulo 3 ofrece una metodología de evaluación de la seguridad operacional con enfoque y ejemplos específicos para aeródromos



Adjunto B del Capítulo 3

METODOLOGÍAS DE EVALUACIÓN
DE LA SEGURIDAD OPERACIONAL PARA AERÓDROMOS

Nota.— El Manual de gestión de la seguridad operacional (SMM) *(Doc 9859) contiene orientación adicional sobre la probabilidad, gravedad, tolerabilidad y matriz de evaluación del riesgo de seguridad operacional.*

1. Dependiendo de la naturaleza del riesgo, pueden utilizarse tres metodologías para evaluar si se lo gestiona de forma adecuada:

a) *Método tipo "A".* Para ciertos peligros, la evaluación del riesgo depende considerablemente de la performance del avión y/o sistema específico. El nivel del riesgo depende de la performance del avión/sistema (por ejemplo, capacidades de navegación más precisas), las cualidades de manejo y las características de infraestructura. Entonces, la evaluación del riesgo puede basarse en el diseño y la validación, la certificación, el resultado de simulación y el análisis de accidentes e incidentes correspondientes al avión/sistema.

b) *Método tipo "B".* Para otros peligros, la evaluación de riesgos no se relaciona realmente con la performance de un avión y/o sistema específico, sino que puede calcularse a partir de medidas existentes de performance del avión. Entonces la evaluación de riesgos puede estar basada en valores estadísticos (por ejemplo, desviaciones) obtenidos de operaciones existentes o en el análisis de accidentes; la elaboración de modelos de riesgo cuantitativos genéricos puede adapt

c) *Método tipo "C".* En este caso, no lógico puede ser suficiente para es esperar a obtener material adici recientemente, ni utilizar estadística

Método de evaluación de riesgos

2. La evaluación de riesgos tiene en consecuencias; se evalúa el riesgo combina que se produzca.

3. Se debe clasificar cada peligro ide repercusiones. Este proceso de clasificació plantea un peligro determinado. La clasific

4. La clasificación de gravedad incl significativa" (clase E). Los ejemplos qu específicos para aeródromos, sirven de guía

PANS — Aeródromos

Adjunto B del Capítulo 3 *3-Adj B-3*

Tabla 3-Adj B-1. Sistema de clasificación de la gravedad con ejemplos

(adaptado del Doc 9859 con ejemplos específicos para aeródromos)

Gravedad	*Significado*	*Valor*	*Ejemplos*
Catastrófico	– equipo destruido – varias muertes	A	– colisión entre aeronaves y/o entre una aeronave y otro objeto durante el despegue o aterrizaje
Peligroso	– gran reducción de los márgenes de seguridad operacional, agotamiento físico o una carga de trabajo tal que haga que ya no se pueda confiar en que los explotadores puedan completar o realizar sus tareas con precisión – lesiones graves – daño importante a la aeronave	B	– incursión en la pista, gran posibilidad de que ocurra un accidente, medidas extremas para evitar la colisión – intento de despegue o aterrizaje en una pista cerrada u ocupada – incidentes durante el despegue/aterrizaje, por ejemplo, aterrizaje demasiado corto o demasiado largo
Grave	– una reducción importante de los márgenes de seguridad operacional, una reducción en la capacidad de los explotadores de adaptarse a condiciones operacionales adversas como	C	– incursión en la pista, con distancias y márgenes de tiempo amplios (no hay potencial de colisión) – colisión con obstáculo en la plataforma/puesto de estacionamiento