Organización de Aviación Civil Internacional

NOTA DE ESTUDIO

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ASAMBLEA — 38º PERÍODO DE SESIONES

COMISIÓN TÉCNICA

Cuestión 29: Seguridad operacional de la aviación — Control y análisis

SISTEMA PARA MEDIR EL RENDIMIENTO EN MATERIA DE SEGURIDAD OPERACIONAL

(Nota presentada por los Estados Unidos)

RESUMEN

En la presente nota se analiza la necesidad de un sistema de indicadores del rendimiento en materia de seguridad operacional en el que se tenga en cuenta la correlación de las mediciones de resultados y procedimientos a fin de evaluar la capacidad de gestión de riesgos en el sistema de transporte aéreo. La nota se basa en la premisa de que el rendimiento en materia de seguridad operacional debería medirse respecto a la eficacia de la gestión de riesgos en todo el sistema de transporte aéreo. En dicha medición debe considerarse el papel del organismo de reglamentación para influenciar el rendimiento de los procedimientos de gestión de la seguridad operacional del proveedor de productos o servicios, así como sus repercusiones en los resultados a nivel del sistema de transporte aéreo. En el rendimiento en materia de seguridad operacional debe considerarse el rendimiento de los procedimientos que conducen a los resultados previstos al respecto, por lo que deberían elaborarse indicadores en consecuencia. En la presente nota se propone un método de evaluación de la seguridad operacional basado en una estructura de tres niveles relativa al "comportamiento" de los sistemas: resultados de alto nivel en materia de seguridad operacional, actuación de los proveedores de servicios y actividades de los organismos de reglamentación.

Decisión de la Asamblea: Recomendar que la OACI considere la adopción del marco propuesto en el apéndice de la presente nota para perfeccionar la metodología de definición de indicadores del rendimiento en materia de seguridad operacional.

Objetivos estratégicos:	La presente nota de estudio se relaciona con el Objetivo estratégico sobre seguridad operacional.
Repercusiones financieras:	Se supone que esto está comprendido en el proyecto de presupuesto.
Referencias:	*Manual de gestión de la seguridad operacional* (Doc 9859) Recomendación 2/3a – Conferencia de alto nivel sobre seguridad operacional (2010) *Resoluciones vigentes de la Asamblea (al 8 de octubre de 2010)* (Doc 9958)

1. INTRODUCCIÓN

1.1 La OACI proporciona (Anexo 19, Capítulo 1) una definición práctica de seguridad operacional: "Estado en el que los riesgos asociados a las actividades de la aviación relativas a la operación de las aeronaves… se reducen y controlan a un nivel aceptable". Se deduce de esta definición que las mediciones de la seguridad operacional deberían abarcar la capacidad de los proveedores de servicios para la gestión efectiva de los riesgos relacionados con la seguridad operacional, lo que se logrará implantando procedimientos de gestión de la seguridad operacional.

2. ANÁLISIS

2.1 Las mediciones del rendimiento en materia de seguridad operacional deberían centrarse en la eficacia del sistema para la gestión de los riesgos relacionados con la seguridad operacional. El énfasis puesto en los "comportamientos" del sistema, que pueden reducir el riesgo de resultados negativos, hace posibles parámetros significativos relativos al rendimiento en materia de seguridad operacional. Una evaluación efectiva de la seguridad operacional debe reflejar los "comportamientos" del sistema respecto al control de los riesgos relacionados con la seguridad operacional y contribuir a las decisiones relativas a la reducción de riesgos.

2.2 Al elaborar un modelo de medición eficaz debe también evaluarse la eficacia de las actividades de vigilancia considerando su efecto en la actuación de los proveedores de servicios, de manera que se reduzca el riesgo de resultados negativos –accidentes e incidentes– relacionados con la seguridad operacional.

2.3 En las mediciones deben también considerarse los procedimientos (actividades y "comportamientos" de las organizaciones y sus miembros) y los resultados (obtenidos mediante dichos procedimientos).

2.4 Con objeto de preparar orientación sobre la manera de elaborar medidas amplia y sistemáticamente, el Grupo internacional de colaboración sobre el sistema de gestión de la seguridad operacional (SMICG)[1] ha preparado el marco de gestión del rendimiento que figura en el apéndice de la presente nota, presentada por los Estados Unidos y elaborada en colaboración con los miembros de SMICG.

2.5 En el marco de gestión del rendimiento, propuesto en el apéndice de la presente nota, figuran medidas según la jerarquía siguiente:

a) resultados globales del sistema, incluidas tasas de accidentes y problemas de seguridad operacional [p. ej., impacto contra el suelo sin pérdida de control (CFIT), pérdida de control, incursiones en la pista];

b) "comportamientos" de los sistemas de los proveedores de servicios de aviación (p. ej., eficacia de los procedimientos de los sistemas clave, tales como instrucción, mantenimiento, control operacional, seguridad operacional en la cabina); y

[1] La presente nota fue preparada en colaboración con organizaciones afiliadas al SMICG, incluidas la Agencia Estatal de Seguridad Aérea (AESA) de España, la Agencia Nacional de Aviación Civil (ANAC) del Brasil, la Administración de Aviación Civil de los Países Bajos (CAA NL), la Administración de Aviación Civil de Nueva Zelandia, la Autoridad de Seguridad Operacional de la Aviación Civil (CASA) de Australia, la Dirección General de Aviación Civil (DGAC) de Francia, la Agencia Europea de Seguridad Aérea (AESA), la Oficina Federal de Aviación Civil (FOCA) de Suiza, la Dirección de Aviación Civil del Japón (JCAB), la Administración Federal de Aviación (FAA) de los Estados Unidos, Transportes Canadá - Aviación Civil (TCCA) y la Administración de Aviación Civil del Reino Unido (UK CAA).

c) actividades de los organismos de reglamentación de la aviación (certificación, aseguramiento de la seguridad operacional permanente, etc.).

2.6 En el método de tres niveles propuesto se proporciona una estructura para evaluar la seguridad operacional mediante correlación de resultados y procedimientos en diversos niveles: resultados de alto nivel en materia de seguridad operacional, actuación de los proveedores de servicios y actividades de los organismos de reglamentación. Estas mediciones proporcionan medios para evaluar la capacidad para la gestión de riesgos en el sistema de transporte aéreo[2]. En el apéndice de la presente nota figura más amplia información sobre dicho marco.

3. CONCLUSIÓN

3.1 Se invita a la Asamblea a convenir en la recomendación siguiente:

a. Recomendar que la OACI considere la adopción del marco propuesto en el apéndice de la presente nota para perfeccionar la metodología de definición de indicadores del rendimiento en materia de seguridad operacional.

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[2] Las aeronaves estatales se excluyen del programa estatal de seguridad operacional.

APPENDIX

A SYSTEM FOR SAFETY PERFORMANCE MEASUREMENT

1. Introduction

1.1 A system for safety performance measurement, created by the SM ICG, considers the role of the regulator to influence performance of product/service provider safety management processes and their impact on outcomes in the air transportation system. The proposed three-tier approach provides a foundation for measurement of safety through correlation of outcomes and processes at various levels: high level safety outcomes, service provider behaviors, and regulatory agency activities. These measures provide the means to assess the capability and to manage risk in the air transportation system.

2. Oversight Responsibilities of States

2.1 ICAO State Safety Oversight System (Annex 19, Appendix 1) Critical Element 2 (CE-2) states that regulations should be designed to control the system design, management practices, and organizational behavior of service providers. One measurement of the overall effectiveness of a State's regulations would be the degree to which they cover key areas of risk.

2.2 Assurance that the service provider has incorporated appropriate risk controls into the design of its systems and processes becomes a basis for the issue of certificates, authorizations, or approvals on the part of the authority (CE-6). This assurance process provides a critical interface between the State Safety Risk Management (SRM), service provider SRM, and State safety assurance. Measures of the State's safety performance must represent how well the State assures that regulations are translated into the operational processes of product and service providers.

2.3 States must conduct surveillance (CE-7) activities to assure continued safety performance as part of their safety assurance process. Measures must be available to evaluate service providers' continuing performance and the effectiveness of the State's performance assurance process.

3. Types of Risks: Common and Unique Causes

3.1 Figure 1 depicts accident rates over time, dividing the trends shown (steep decline, slow decline, level) into categories that are dependent on the organizational processes used to manage safety. Common cause occurrences are those to which all or a large segment of the population of interest are exposed and for which there are equivalent or highly similar (and thus "common") causes. In phase 1, prescriptive rules or regulations manage common cause failures.

3.2 In phase 2, many of the risks that can be effectively controlled through prescriptive regulations have been addressed. Remaining risks occur more randomly, associated with problems unique to individual service providers. Service providers' SMS processes are essential to identify and treat these risks. Safety measurements must, therefore, address the design and performance of service providers' SMS processes and their ability to address unique risks.

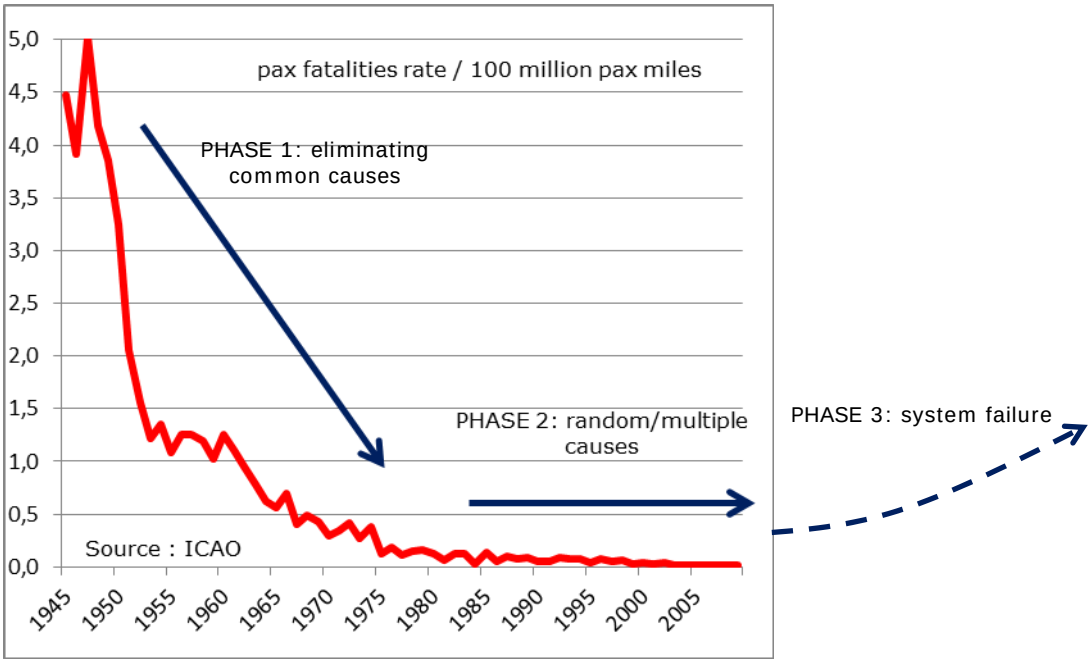

Figure 1. Accident Trends and Causes

3.3 At the same time, management of risks addressed through compliance with existing rules must be maintained. Phase 3 represents a situation in which the relaxation of prescriptive regulations would mean that the gains made in phase 1 are reversed. Thus implementation and compliance with basic safety standards must be part of the safety management strategy and must, therefore, be part of the measurement strategy.

4. Risk Control: Measurements of Compliance and Risk Management

4.1 Figure 2 shows the relationship between "things that are unsafe" (risk – circle on the right) and "things that are illegal" (contrary to prescriptive regulations – circle on the left). Managing risk of all sources of risk would entail identification and management of all possible "unsafe" situations. Measurement of the effectiveness of risk management involves assessing how completely this is done. Though there is typically an intersection between the two, the overlap is not total and not zero. The intersection between the two circles represents the set of situations in which hazards and threats are covered by regulations, typically focusing on technology, training, or procedures. These are the "common cause" hazards that were discussed above. Note that this is a subset of compliance and, if all rules appropriately addressed legitimate hazards, would represent the totality of compliance.

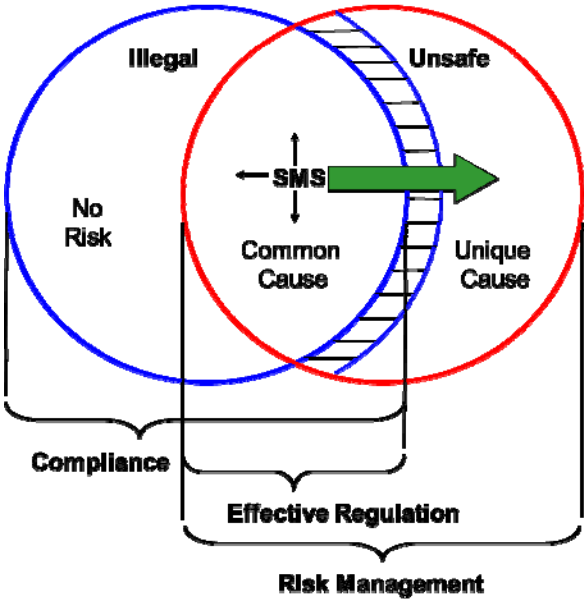

Figure 2. Relationship Between Regulatory Requirements and Risk

4.2 The requirement for an SMS is placed in this overlap area between the circles. This takes the position that the need for an SMS is common to all service providers. It further recognizes that effective compliance entails use of an operator's SRM processes to tailor the method of compliance to its situation. However, service providers must also control hazards that are outside of the scope of practical regulations but that exist in their operational environment. Control of unique problems is best controlled by the processes incorporated in an SMS. The SMS also requires a product/service provider to identify hazards in their systems and operational environment, assess these hazards for their degree of risk, take action to control those that pose an unacceptable degree of potential harm, whether those risks are the subject of regulations or not.

4.3 Note then that the overlap area is labeled with the bracket "effective regulation". This is not to say that all rules and compliance efforts are assumed a priori to be effective but that assessment of regulatory effectiveness should be based on how well this is done.

4.4 The area of "things that are unsafe" but not illegal, represents unique cause risks that generally cannot be controlled by regulation. The area bounded by the hatched area outside of the area of overlap represents a situation where effective risk controls are either outside of current technology or where the costs of implementing controls outweigh their benefits to society.

4.5 The area of "things that are illegal" but not harmful (the part of the left hand circle outside of the "unsafe" circle) represents ineffective regulations where compliance is not correlated with safety. This could be because the rules were inadequately developed to begin with, are obsolete, or were applied too broadly to service provider groups that are not exposed to the hazard that the regulation addresses.

5. The Safety Performance Measurement System

5.1 The measurement system structure depicted in Figure 3 is based on three tiers[3] (2000) of analysis that represent the activities and performance of both the State and service providers in the civil aviation system. The levels of the system include: measures of the integrated civil aviation system, measures of service provider system behaviors, and measures of activities of regulatory authorities, as well as four pillars which describe the way safety is measured and managed.

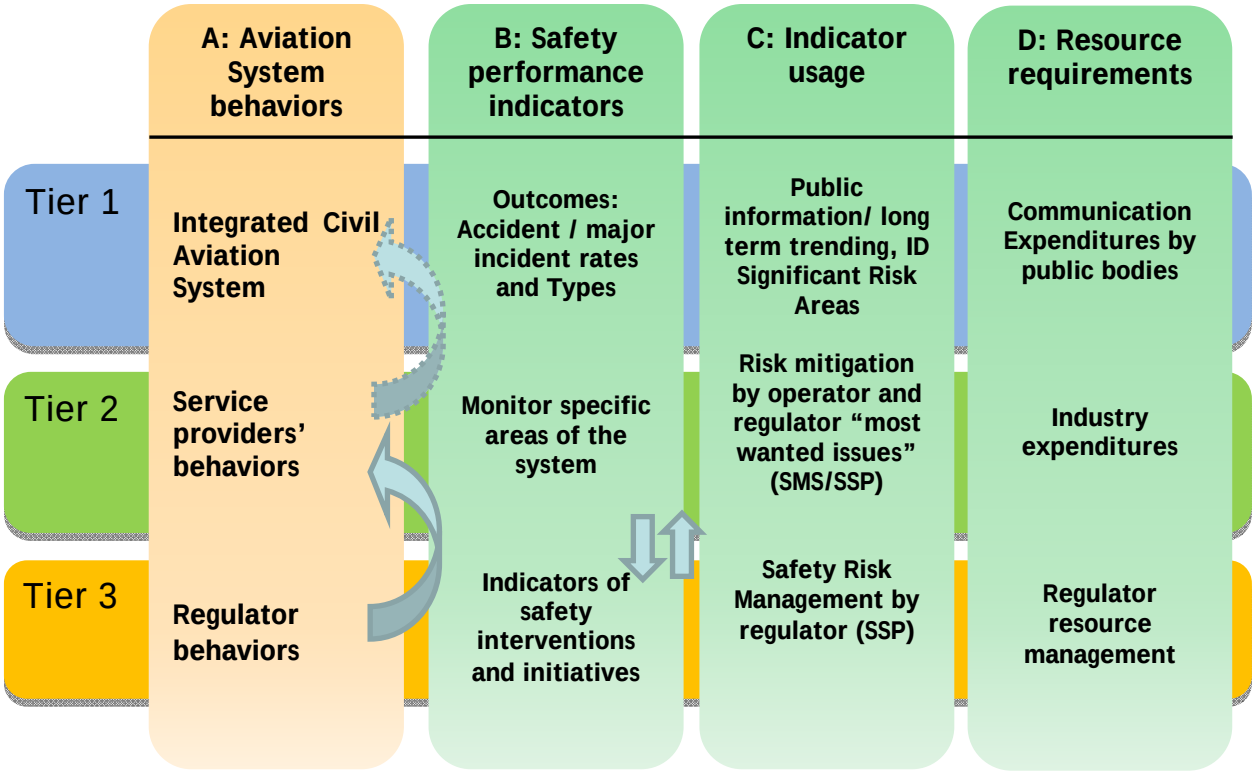

Figure 3. Safety Performance Measurement Matrix

5.2 Indicators of performance (column B) consist of both process and outcome measures. Process measures are measures of the functioning of key safety management processes such as safety risk management and safety assurance on the part of both States and service providers.

6. The Indicator Framework

6.1 The safety performance indicator model in Figure 4 provides a top-level concept for safety performance measurement that represents an expansion of the second column of the Safety Performance Measurement Matrix (Figure 3) to guide actual indicator development.

[3] The model for the matrix was adapted from *The Regulatory Craft: Controlling Risk, Solving Problems and Managing Compliance* by Dr. Malcolm Sparrow, Harvard University, 2000.

		OUTCOMES	PROCESSES	INTER-TIER CORRELATIONS
I	INTEGRATED CIVIL AVIATION SYSTEM	(1) Accident rates, Incident rates, Fatalities (etc.) (2) Breakdown of Event rates for significant risk areas	∑ Safety Management capability (effectiveness of): - Identifying common cause hazards - Effectiveness of regulatory risk controls	N/A
P	SERVICE PROVIDER PERFORMANCE	per Service Provider: outcomes related to significant risk areas	SMS performance: - SRM/compliance with regulatory specifications - Ability to identify unique cause threats Effectiveness of risk control actions	Influence of Service Provider activities on safety outcomes
R	REGULATOR PERFORMANCE (ACTIVITIES)	Activities and initiatives to address specific risk areas - Effectiveness or risk controls (correlation with Service Provider behaviors and aggregate outcomes) - Effectiveness of risk control application (Oversight system performance – Design Assurance and Performance Assurance)	Safety risk management capability : - Ability to identify common cause threats - Ability to develop risk controls	Influence of regulator activities on Service Provider behaviors Influence of regulator activities on safety outcomes

Figure 4: Safety Performance Indicator Framework

6.2 The indicator framework is organized into the same three tiers used in the measurement matrix depicted in Figure 3. Each level of the proposed framework is divided into two related dimensions: outcomes and processes (the middle two columns). The fourth column represents correlations between tiers of the model. Validity of the measures in Tiers 2 and 3 is based upon the correlation with the next tier above them. For example, the validity of measures of oversight activities is based upon the relationship between the measured oversight activities and their influence on service provider behaviors and outcomes.

6.3 Tier 1 outcome measures come in two varieties: overall event rates (e.g. accident rates, hull loss rates), and event rates related to significant risk areas (for an example, see the UK CAA's "significant seven"). These event types are those associated with common cause hazards — those hazards to which all or large segments of the product/service provider community are exposed.

6.4 Tier 2 measures address the behavior of service provider systems whose performance relates to safety outcomes. At Tier 2, a set of safety outcomes should be identified for tracking. These should start with the significant risk areas identified for Tier 1, representing an association with common cause hazards. This set of outcomes should also include measures related to hazards that are unique to the product/service provider.

6.5 Compliance with regulations (the State's specifications for control of hazards common to the service provider's population) is part of the process of risk management. Therefore, measurement of compliance should also include measures of how well the service provider has used its SRM process to incorporate relevant regulations into its processes.

6.6 Tier 3 indicators are process and outcome measures to gauge the safety interventions and initiatives of the regulator. Effective regulator activities should motivate and facilitate service provider behaviors that, in the aggregate, result in overall improvements in safety outcomes. Tier 3 indicators will in many cases be linked directly to Tier 2 indicators as the latter are required to measure how effectively regulator activities and behaviors have addressed key safety issues identified. The ability to influence future performance is an important characteristic of both Tier 2 and Tier 3 indicators.

6.7 At Tier 3, regulator activities must be based upon influencing the behaviors of product and service providers. Regulator action at Tier 1 considers the entire civil aviation system or major system components. Accountability for identifying and designing risk controls for these common cause hazards rests primarily with the regulator. Measuring the effectiveness of the regulator's accomplishment of this responsibility is, therefore, a matter of evaluating these functions.[4]

6.8 Measures of regulator safety management performance should include measures of how well the regulator is able to accomplish its design assurance (certification) functions (part of the State's assurance process). Validity of these measures should reflect the degree to which the regulator is able to influence the system and process design of service providers. Regulators' design assessments include an assessment of how well the service provider has identified and controlled hazards that are unique to its own systems and environment.[5]

6.9 As part of their performance assurance function, regulators must also assure "continuing operational safety" on the part of service providers. To do this, they must measure and assess service provider performance.[6] Regulators must also take action on those areas of service provider performance that fail to control risk in their operations to an acceptable level.[7]

— END —

[4] This would also measure critical element of oversight number two (CE-2).

[5] This would also be a measure of critical element of oversight number six (CE-6). Such a measure should be based on the regulator's assessment of the service provider's effective use of their SRM process in order to assure that the designs of their systems effectively control hazards as intended in regulations as well as any hazards unique to the service provider.

[6] This would also measure critical element of oversight number seven (CE-7).

[7] This would also measure critical element of oversight number eight (CE-8).