Organisation de l'aviation civile internationale

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COMMISSION TECHNIQUE

Point 29 : Sécurité de l'aviation — Surveillance et analyse

SYSTEME DE MESURE DE LA PERFORMANCE DE SÉCURITÉ

(Note présentée par les États-Unis)

RÉSUMÉ ANALYTIQUE

La présente note de travail porte sur le besoin d'un système d'indicateurs de performance de sécurité prenant en compte la corrélation des résultats et des mesures sur le processus pour évaluer la capacité de gérer les risques du système de transport aérien. Cette note est basée sur l'hypothèse que la performance de sécurité devrait être mesurée en termes de qualité de la gestion des risques dans l'ensemble du système de transport aérien. La mesure de la performance de sécurité doit prendre en compte le rôle du réglementateur qui influence les performances des processus de gestion de la sécurité des fournisseurs de produits et de services et leurs impacts sur les résultats au niveau du transport aérien. La performance de sécurité doit prendre en considération la performance du processus qui conduit aux résultats attendus et il convient d'élaborer des indicateurs à cet effet. La présente note propose une méthode de mesure de la sécurité basée sur trois niveaux de comportement du système : un niveau supérieur qui est celui des résultats, un niveau relatif aux comportements des fournisseurs de services, et un niveau lié aux activités de l'organisme de réglementation.

Suite à donner : Recommander que l'OACI envisage l'adoption du cadre proposé dans l'annexe de la note pour mieux développer la méthodologie de définition des indicateurs de performance de sécurité.

Objectifs stratégiques :	La présente note de travail se rapporte à l'Objectif stratégique Sécurité.
Incidences financières :	Devraient être couvertes par le projet de budget.
Références :	Doc 9859, *Manuel de gestion de la sécurité* Conférence de haut niveau de 2010 sur la sécurité, Recommandation 2/3a Doc 9958, *Résolution de l'Assemblée en vigueur (au 8 octobre 2010)*

1. INTRODUCTION

1.1 L'OACI (Chapitre 1 de l'Annexe 19) donne une définition opérationnelle de la sécurité : « État dans lequel les risques liés aux activités aéronautiques sont réduits et maîtrisés à un niveau acceptable ». Il découle de cette définition que les mesures de la sécurité doivent inclure la capacité des prestataires de services de gérer efficacement les risques de sécurité, ce qui suppose la mise en œuvre de processus de gestion de la sécurité.

2. ANALYSE

2.1 Les mesures de performance de sécurité devraient se concentrer sur la qualité de la gestion des risques de sécurité par le système. L'accent mis sur les comportements du système peut

réduire les risques de résultats indésirables pour les métriques significatives de la performance de sécurité. Pour être efficaces, les mesures de sécurité doivent refléter les comportements du système en ce qui concerne la maîtrise des risques de sécurité et contribuer aux décisions en matière d'atténuation des risques.

2.2 L'élaboration d'un modèle de mesure efficace doit également tenir compte de l'efficacité des activités de supervision qui ont une influence sur les comportements de prestataires de services pour des aspects réduisant le risque de conséquences négatives — accidents et incidents.

2.3 Les mesures doivent aussi tenir compte des processus (activités et comportements des organisations participantes et de leurs membres) et des conséquences (résultats des processus).

2.4 En vue de préparer des éléments d'orientation sur la manière d'élaborer des mesures aussi complètes et systématiques que possible, le Groupe de collaboration internationale sur les systèmes de gestion de la sécurité (SM ICG)[1] a défini un cadre de gestion de la performance qui est annexé au présent document de travail. À noter que, bien que présenté par les États-Unis, ce cadre est le fruit d'un travail de collaboration avec les membres SM ICG.

2.5 Le cadre de gestion de la performance proposé en appendice du présent document contient des mesures organisées selon la hiérarchie suivante :

a) les résultats globaux du système, notamment les taux d'accidents et de problèmes de sécurité notables (p. ex., impacts sans perte de contrôle (CFIT), pertes de contrôle, intrusions sur les pistes) ;

b) le comportement des systèmes des fournisseurs de services d'aviation (p. ex., performance des processus des systèmes clés, comme la formation, la maintenance, le contrôle opérationnel, la sécurité en cabine) ;

c) les activités des organismes d'encadrement réglementaire de l'aviation (p. ex., certification, assurance du maintien de la sécurité opérationnelle, etc.).

2.6 L'approche à trois niveaux proposée fournit une base pour la mesure de la performance de sécurité par la corrélation des résultats et des processus aux différents niveaux : résultats de la sécurité de haut niveau, comportements des fournisseurs de services, activités des services de réglementation. Ces mesures fournissent un moyen d'évaluer la performance et de gérer les risques dans le transport aérien[2]. D'autres détails concernant ce cadre sont présentés dans un appendice à la présente note.

3. RECOMMANDATION

3.1 L'Assemblée est invitée à convenir de la recommandation suivante :

a. recommander que l'OACI envisage l'adoption du cadre proposé dans l'appendice de la présente note pour poursuivre le développement de la méthodologie de définition des indicateurs de performance de sécurité.

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[1] La présente note a été préparée en collaboration avec les organisations membres du SM ICG, notamment l'Agence de sûreté et de sécurité de l'aviation (AESA) de l'Espagne, l'Agence nationale de l'aviation civile (ANAC) du Brésil, l'Autorité de l'aviation civile des Pays-Bas (CAA NL), la Civil Aviation Authority de la Nouvelle-Zélande, la Civil Aviation Safety Authority (CASA) de l'Australie, la Direction Générale de l'Aviation Civile (DGAC) de la France, l'Agence européenne de la sécurité Aérienne (AESA), l'Office fédéral de l'aviation civile (OFAC) de la Suisse, le Bureau de l'aviation civile (JCAB) du Japon, l'Organisation de la sécurité de l'aviation de la Federal Aviation Administration (FAA) des États-Unis, Transports Canada - Aviation civile (TCAC) et la Civil Aviation Authority du Royaume-Uni (UK CAA).

[2] Les aéronefs propriété de l'État ne font pas partie du programme de sécurité de l'État.

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.

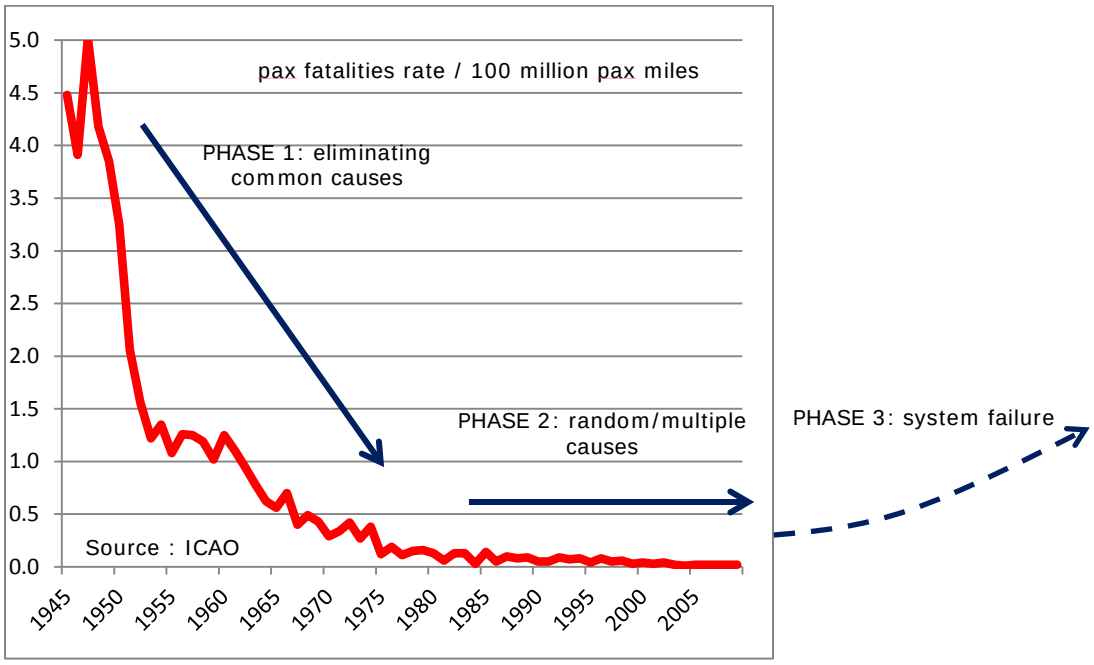

Figure 1. Accident Trends and Causes

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.

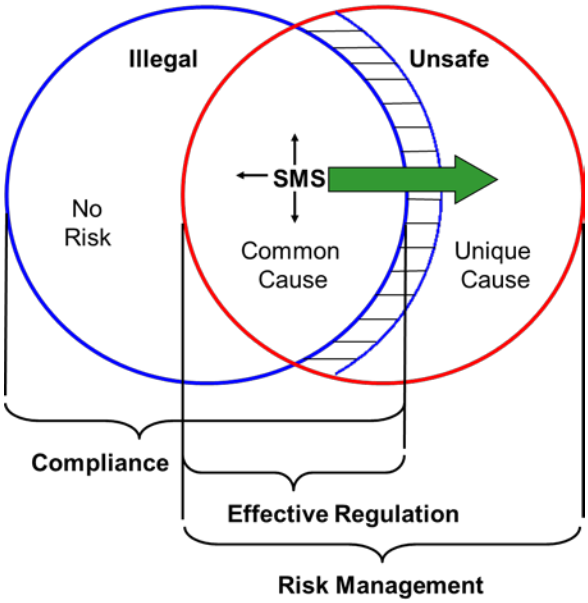

Figure 2. Relationship Between Regulatory Requirements and Risk

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.

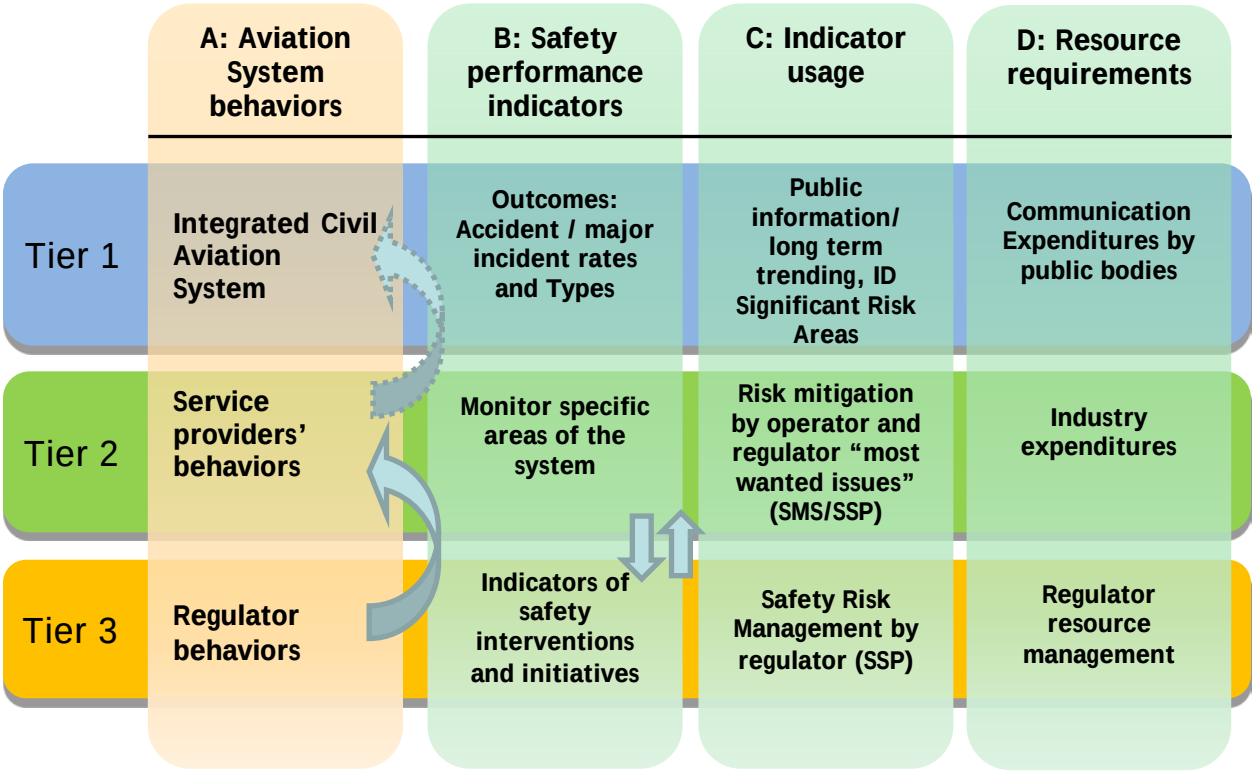

Figure 3. Safety Performance Measurement Matrix

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]

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[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).