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Agenda Item 30: Aviation Safety and Air Navigation Policy

30.3 Relevant Outcomes of the High-level Conference on COVID-19, Safety Stream (HLCC 2021)

STANDARDIZATION OF SAFETY PERFORMANCE INDICATORS

(Presented by Colombia, supported by Argentina, Bolivia (Plurinational State of), Chile, Dominican Republic, Ecuador, El Salvador, Guyana, Mexico, Panama, Paraguay, Peru, Suriname, Uruguay and Venezuela (Bolivarian Republic of))

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EXECUTIVE SUMMARY

The *Global Aviation Safety Plan (GASP)* is quite clear in its presentation of events of major concern, namely RE, RI, CFIT, LOC-I and MAC.

Annex 19 – *Safety Management*, for its part, sets forth obligations, as aviation service providers are required to develop safety performance indicators proactively, for they are under an obligation to implement safety management systems (SMS).

Member States of the International Civil Aviation Organization must develop standardized safety performance indicators (SPI), by aviation subsector, as precursors to events defined as being of major concern.

As matters stand, each service provider should first of all take the measure of such events, which would permit recognition of “pathological” forms of behaviour that could lead to system deterioration and ultimately to GASP-identified occurrences of major concern.

Action: The Assembly is invited to:

- a) endorse this working paper; and
- b) request ICAO to develop standardized safety performance indicators (SPI) for due measurements by service providers.

<i>Strategic Objectives:</i>	This working paper relates to the Safety Strategic Objective.
<i>Financial implications:</i>	None is expected.
<i>References:</i>	Annex 19 – <i>Safety Management</i> Doc 10004, <i>2020-2022 Global Aviation Safety Plan</i> Doc 9859, <i>Safety Management Manual (SMM)</i>

¹ Spanish version provided by Colombia.

1. INTRODUCTION

1.1 The Global Aviation Safety Plan (GASP) lists high-risk categories (HRC) of high severity (high fatality) occurrences, namely:

- a) controlled flight into terrain (CFIT);
- b) loss of control in-flight (LOC-I);
- c) mid-air collision (MAC);
- d) runway excursion (RE); and
- e) runway incursion (RI).

1.2 These events are described in Appendix B to Doc. 10004, 2020-2022 edition, under Operational Safety Risks Roadmap, in terms of safety enhancement initiatives and the contributory risk factors of each category mentioned above.

1.3 However, even though ICAO has statistics that underpin these category determinations (in www.icao.int/safety/Pages/Safety-Report.aspx), it is also necessary to compile precursor-event data on HRC-listed occurrences on the basis of the industry's own activities and measurements.

1.4 Standardized SPI measurement should in turn underpin indicators listed in regional safety plans, thus promoting adequate SPI measurement by service providers.

1.5 A (short) list of indicators for use in measuring HRC precursor events, sourced from service providers in the various subsectors in each State, would trigger the dynamics of standardization at the macro and micro levels, in other words globally and regionally, within the State and within the industry.

2. ANALYSIS

2.1 Safety performance indicators (SPI) are core elements in the configuration and operation of each safety management system (SMS).

2.2 Identification and measurement of precursor events in high-risk categories of occurrences should constitute the bases of standardized measurement of events that could lead to aviation system degradation.

2.3 Identification of precursor event triggers will therefore make it possible to pinpoint intra-organizational failures in taking, within the industry itself, timely action (decisions) that may in turn become safety enhancement initiatives as effective barriers in the prevention of high-severity occurrences.

2.4 No precursor event data set is currently available for conversion to SPIs for measurements by aviation service providers. As a result, in taking action, each State develops (agrees), in conjunction with the industry, indicators that are considered most adequate to the best of their knowledge and understanding. It is likely, however, that they ultimately measure events that do not have a major

impact on, or have a low incidence in, high-risk occurrences and consequently do a great deal of work to achieve few results.

2.5 Conversely, if several States in each region measure the occurrence of the same events (bearing in mind that, in some cases, several States share common underlying factors such as topography and meteorology), measurements could be taken regionally, thus yielding data crucial to the achievement of GASP Target 4.2² and of regional plans, while best practices in the implementation of action plans or applications for improved resource allocation between each subsector, industry, State and/or region could, moreover, be shared.

2.6 In addition to the likely contribution to Target 4.2 mentioned above, this working paper aim to support and provide tools for GASP Goal 5 and, consequently, the achievement of GASP Target 5.1, which calls for all service providers to use globally harmonized SPIs as part of their SMS, taking into account operational needs. The term “globally harmonized SPIs” refers to the use of globally harmonized metrics for the development and monitoring of service providers’ SPIs.

2.7 The proposed SPI data set is contained in Appendix A to this working paper.

3. CONCLUSION

3.1 Standardized definition and measurement of events will make it possible to combine efforts and conduct better analyses, which may minimize HRC occurrences.

3.2 The ICAO Assembly is invited to promote the development of standardized SPIs by using either the list contained in this document or a different list of standards by subsector.

3.3 States are urged to develop SPIs for measurements by aviation service providers, on the basis of historical data (a minimum of five (5) years), that can be used to define HFC precursor event profiles and behaviour.

² Target 4.2 calls for States to contribute information on safety risks, including SSP SPIs, to their respective RASGs by 2022. This target aims at building up each RASG’s safety risk management capabilities. GASP indicators for this target include the number of States and service providers contributing information on safety risks to RASGs, as well as the number of States that are sharing their SSP SPIs with the RASGs.

APPENDIX A

Proposed minimal list of safety performance indicators (SPI) to be measured by each service provider

In defining indicators, each region and each State must first identify risks in order next to set objectives, indicators (SPI), baselines, targets and alert levels.

SPIs must be specific, measurable, achievable, relevant and timely (SMART) and must be based on safety objectives and the State risk panorama.

However, even though safety objectives are set on the basis of the State risk panorama and indicators must be revised and validated periodically to reflect exactly the real and existing panorama of State risks, this list proposes minimal indicators of events that have the potential (precursors) to lead to the occurrence of the five high-risk category events (HRC); it is important to stress that the list does not comprise all of the indicators that could be measured in each subsector and by each service provider in that sector.

A list is proposed below of SPIs that could be measured in each State through each service provider's SMS.

High-risk category event (HRC)	Safety performance indicators (SPI)	Rate calculated in
	Scheduled commercial passenger aviation	# take-offs (departures)
RE	Rate of unstabilized approaches	per 100,000 departures
MAC	Rate of TCAS RA events	per 100,000 departures
RE	Rate of hard landings	per 100,000 departures
RE	Rate of long landings	per 100,000 departures
LOC-I	Rate of occurrence of sudden engine shutdown	per 100,000 departures
CFIT	Rate of GPWS alerts	per 100,000 departures
	Unscheduled (fixed wing) commercial aviation	# take-offs (departures)
MAC	Rate of loss of in-flight aircraft separation (without TCAS)	per 100,000 departures
MAC	Rate of TCAS RA events	per 100,000 departures
CFIT	Rate of entries in adverse weather conditions	per 100,000 departures
LOC-I	Rate of non-engine system malfunction	per 100,000 departures
LOC-I	Rate of engine system malfunction	per 100,000 departures

LOC-I	Rate of sudden engine shutdown	per 100,000 departures
RE	Rate of unstabilized approaches	per 100,000 departures
MAC	Rate of deviation from SOP	per 100,000 departures
Unscheduled (rotary wing) commercial aviation		# take-offs (departures)
RE	Rate of hard landings	per 100,000 departures
LOC-I or CFIT	Rate of occurrences involving use of contaminated or incorrect type of fuel	per 100,000 departures
LOC-I	Rate of loss of tail rotor effectiveness	per 100,000 departures
LOC-I	Rate of powered drop events	per 100,000 departures
LOC-I	Rate of non-engine system malfunction	per 100,000 departures
LOC-I	Rate of engine system malfunction	per 100,000 departures
MAC	Rate of deviation from SOP	per 100,000 departures
LOC-I	Rate of events due to incorrect application of external load procedure	per 100,000 departures
Cargo aviation		# take-offs (departures)
RE	Rate of hard landings	per 100,000 departures
MAC	Rate of TCAS RA events	per 100,000 departures
RE	Rate of unstabilized approaches	per 100,000 departures
LOC-I	Rate of engine system malfunction	per 100,000 departures
LOC-I	Rate of sudden engine shutdown	per 100,000 departures
LOC-I	Rate of non-engine function	per 100,000 departures
LOC-I or CFIT	Rate of events due to weight and balance errors	per 100,000 departures
Special aerial work aviation		# take-offs (departures)
MAC	Rate of deviation from SOP	per 100,000 departures
LOC-I	Rate of non-engine system malfunction	per 100,000 departures
LOC-I	Rate of engine system malfunction	per 100,000 departures
MAC	Rate of loss of in-flight aircraft separation (without TCAS)	per 100,000 departures
MAC	Rate of entries in adverse weather conditions	per 100,000 departures
RE	Rate of hard landings	per 100,000 departures
CFIT	Rate of intentional abrupt manoeuvres	per 100,000 departures
Training centres		# take-offs (departures)
RE	Rate of hard landings	per 100,000 departures
LOC-I or CFIT	Rate of occurrences involving use of contaminated or incorrect type of fuel	per 100,000 departures
LOC-I	Rate of events evincing loss of situational awareness	per 100,000 departures

MAC	Rate of entries in adverse weather conditions	per 100,000 departures
LOC-I	Rate of non-engine system malfunction	per 100,000 departures
LOC-I	Rate of engine system malfunction	per 100,000 departures
RE	Rate of unstabilized approaches	per 100,000 departures
Aircraft maintenance		# Hours/human
LOC-I or CFIT	Rate of serious damage to aircraft during maintenance activities	per 10,000 hours/human
LOC-I or CFIT	Rate of events involving incorrect or inadequate application of maintenance data or procedures	per 10,000 hours/human
LOC-I or CFIT	Rate of cases evincing inappropriate storage of hardware or component during maintenance	per 10,000 hours/human
Aerodrome operation		# Operations
RI	Rate of events with incorrect presence of a person, vehicle or aircraft on surface designated for take-off and landing	per 100,000 operations
RE	Rate of cases of foreign object damage (FOD)	per 100,000 operations
LOC-I	Rate of birdstrike(s) – with damage	per 100,000 operations
RI	Rate of cases of runway confusion	per 100,000 operations
LOC-I	Rate of collision with obstacle(s) during take-off or landing	per 100,000 operations
RE	Rate of collision with the ground	per 100,000 operations
RI	Rate of events of loss of AC control on the ground	per 100,000 operations
RI	Rate of failures in ground handling service provision	per 100,000 operations
Air Navigation Services		# Operations
LOC-I or RE or RI	Rate of ground-air communication failure	per 100,000 operations
LOC-I or RE or RI	Rate of ATS data processing system failure	per 100,000 operations
LOC-I or RE or RI	Rate of cases evincing incorrect monitoring (aircraft, animal, hardware, frequencies, persons)	per 100,000 operations
LOC-I or RE or RI	Rate of cases involving incorrect/inadequate ATM/ATS procedure (alerts, emergencies, ascents, departures).	per 100,000 operations

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