Considerations Related to the Development of Safety Performance Indicators within an EASA Part 145 Organisation

This document presented by Sofema Aviation Services (SAS) www.sassofia.com considers the role and purpose of Aviation Safety Management System (SMS) - Safety Performance Indicators (SPI)

Introduction – Maintenance Key Performance Indicator (KPI)

Typically measures how well your operation is doing at achieving its maintenance goals, for example reducing downtime or costs. KPI's can be used as a benchmark to understand your organisations current position as well as to facilitate the development of Key Performance goals.

Maintenance key performance indicators (KPIs) vary according to the company, its goals, strategies and action plans. However, there is a set of indicators that is well-regarded and used more often. Consider the following Features

- The selection of KPI's can relate to many different elements and aspects including financial – efficiency of the process – health and safety (SMS) considerations – defects and pilot reports (PIREPS) following maintenance.

- Once a detailed assessment has been made it is possible to consider which are the most relevant indicators applicable to the delivery of the most effective maintenance.
    - How do these indicators relate to each other and do they meet the requirement?
    - Is the measurement process of the chosen indicators effective?

Notes

- KPI's are not Safety Performance Indicators (SPI) nor are they directly related to the achievement of safety objectives (although they can be a feature within the overall safety management system.)

- Whilst KPI's are closely related to the performance level you want to achieve, don't take them for goals themselves. (Means an indicator is only a metric which we use quantitatively to demonstrate the performance of a given maintenance activity, asset or department.

- When developing KPI's it is important that they relate to the entire process including the various inputs and outputs so that they are able to genuinely benchmark the performance of the maintenance.

Safety Performance Indicator

A safety performance indicator (SPI) is defined in the ICAO Safety Management Manual as a measure (or metric) used to express the level of safety performance achieved in a system.

- Generally expressed in terms of the frequency of occurrences of some event causing harm, e.g., A number of events / year or / 000's of Hrs of operation.

- A set of indicators should also include leading indicators.

Note – These indicators do not require a safety event to take place and are metrics that provide information on the current situation that may affect future performance.

What is the main difference between Safety Performance Indicators (SPI) and Safety Performance Targets (SPT)?
ICAO defines:

- Safety Performance Indicators as "A data-based parameter used for monitoring and assessing safety performance".
- Safety Performance Targets as "The planned or intended objective for safety performance indicator(s) over a given period".

The following table is the EASA proposed baseline set of SPI's (Note this is essentially for Operators – Currently EASA has not created a baseline set of SPI's for use of an EASA Part 145 Aircraft Maintenance Organisation (AMO)

Category	Indicators
LOC-I: Loss of control - inflight	• Stick shaker • Increased roll attitude or rate • High pitch angle • Overspeed (vertical or configuration) • Failure of primary flight instruments
CFIT: Controlled flight into or toward terrain	• EGPWS hard warnings • Descent below MSA • Navigation errors
RE: Runway excursion	• Abnormal runway contact • Loss of control on ground • Long or fast landings • Occurrences with crosswind conditions • High speed rejected take-offs • ATA32 related occurrences
MAC: Airprox/ ACAS alert/ loss of separation/ (near) midair collisions	• Losses of separation • Inadequate separation • Level Busts • Airspace Infringement
RI-VAP: Runway incursion - vehicle, aircraft or person	• Runway Incursions
GCOL: Ground Collision and RAMP: Ground Handling	• Taxiway incursions • Avoiding manoeuvres during taxi • Aircraft collisions and collisions with aircraft
System Component Failure	• Engine failure • Flight control problems • Helicopter tail rotor and main rotor blade failures or malfunctions

SPI/SPT Development Considerations

- Specific understanding regarding the selection of the relevant safety concern to be treated to ensure both validity & relevance.
- Avoid complexity wherever possible – simple is better and can clearly reflect relevant safety concerns.
- Use clear definitions to avoid ambiguity.
- Phased approach to implementation – achieves the ultimate objective in stages.
- Avoid high workload analysis.
- Ensure a broad coverage is important do not only pursue extremes (to capture systemic exposure that can agglomerate into more significant events.
- Make sure time frames are clear and understood (data capture rate).
- Avoid quantity over quality measure what is important, not easy.

Leading & Lagging SPIs and SPTs

Lagging indicators are reactive in nature that measures an organization's performance like the number and types of incidents occurred based on the information from past incidents and accidents such as reactionary analysis. Reactionary analysis is analyzing past data to find loopholes in processes and policies
Leading indicators are proactive and preventive measures that can shed light about the effectiveness of safety and health activities and reveal potential problems in a safety and health program.

Many employers are familiar with lagging indicators.

- Incorrect application of the MEL / 1000 Departures
- Missed Airworthiness Directive (AD) / 10,000 FH

Leading SPIs/SPTs – sometimes known as “Process SPIs/SPTs” – measure situations which have the potential to become or contribute to high severity/low probability negative outcomes:

- Leading SPIs support proactive development of the organisation’s safety management System – Capability to improve safety exposure.

    - SPI – 0.75 events of foreign object damage FOD) to aircraft per 10,000 Maintenance Activity (Ramp Transit & Minor Check)
    - SPT: To reduce to 0.5 events of foreign object damage to aircraft per 10 000 Maintenance Activity (Ramp Transit & Minor Check) within 12 months from the introduction.

Further Considerations Lagging & Leading Indicators

- Lagging safety performance indicators should match thee above criteria.
- For leading indicators it should be validated that they are representative as measurement for accident risk.
- In general it can be said that it is not unreasonable to assume there is a positive relation between a correct functioning system of organisation and aviation safety.
- Effort is required to validate that positive relation. Some of the indicators suggested are Boolean; they are either true of false. Boolean indicators are straightforward to quantify, comprehendible and cost-efficient.
- To assure sensitivity to changes safety performance measurement must be done frequently increasing costs of obtaining the results; a proper balance needs to be found.
- Lagging indicators are metrics for safety events that have already occurred.
- Risk controls will attempt to address many leading and lagging indicators. When erosion of risk controls occurs, the severity of lagging indicators will increase and there will be a negative impact on the percentage of standard operating procedure (SOP) hazards identified

Implementation of Maintenance Safety Performance Indicators

Safety performance indicators are important because they measure the proper functioning of the organisations barriers that exist as well as considering also the interfaces between our organisation and customers as well as other related (contracted & subcontracted) organizations.

Consider the following:

- The main goal of aviation safety performance indicators is to provide an indication of the probability of an incident / accident.
- This can be done using lagging and leading indicators.
- The total set of indicators should remain manageable.
- Each individual indicator should match the following criteria:
    - Quantifiable and permitting statistical inferential procedures
    - Valid or representative to what is to be measured
    - Provide minimum variability when measuring the same conditions
    - Sensitive to change in environmental; or behavioural conditions
    - Cost of obtaining and using measures is consistent with the benefits
    - Comprehended by those in charge with the responsibility of using them

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Examples of Suitable SPI's for the Maintenance Environment

- Operational Incidents due to maintenance
- Operational Accidents due to maintenance
- TIR Technical Incident Reports
- IFSDEngine Inflight Shutdowns

- MELExtensions Requested extensions for MEL items
- AD Airworthiness Directives irregularities
- Average risk level determined for all occurrences
- Maintenance Unscheduled Engine Removals,
- Failures in emergency equipment during
- Voluntary Reports Voluntary Occurrence Reports,
- Number of major risk incidents (as defined in SMM)
- Number of MORs
- Number of internal audits
- Number of audit findings per audit
- Number of safety committee meetings
- Safety committee attendance of key personnel
- Number of ERP drills
- Number of hazard / safety reports
- Number of safety newsletters issued
- Number of formal risk assessments
- Number of safety surveys
- Number of airworthiness incidents (as defined in SMM)
- Number of flights flown with operational MEL restrictions

Next Steps

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