Safety Performance Frameworks
Sharing experience and valuable lessons learned

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Overview

- Background of a safety performance framework,
- Threats, pitfalls and issues to consider,
- Examples.
What is a safety performance framework?

Structure to measure the safety of an organisation, operation etc. by means of indicators.
Why a safety performance framework?

- Need to know how good or bad you are doing
- Managers like to manage using indicators

“You can't manage what you can't measure.”

Bill Davis, director FAA Office of Runway Safety
Can we measure safety?

- Safety is not a directly measurable state,
- Difficult observe safety,
- Indications.
Content of a safety performance framework

- Definitions,

- Data flow description,

- List of indicators,

- Reporting format,

- Basic analysis (trends, targets).
Core element of a safety performance framework

- Safety indicators are core element
  - Qualitative and/or
  - Quantitative

- Preference for quantitative indicators:
  - Frequency (e.g. number of incidents)
  - Rates (e.g. incident rate)
How are safety performance indicators used?

- Compare indicators against identified targets,
- Trend analysis,
- Benchmarking.
Pitfalls and threats of a safety performance framework

- Experience with non-safety related indicators,
- Unclear definitions,
- Focus one a single indicator,
- Only reactive indicators,
- Very complex indicators,
- Incorrect normalisation of the data,
- Too scientific,
- ‘Bill Gates’ trend analysis.
Issues to consider with quantitative indicators

- Reporting bias & data quality,
- Statistical uncertainties.

A calculated rate is an estimation not a measurement!
Examples
Choice of exposure data-1

• Normalise occurrences/events by:
  – Number of flights,
  – Flight hours,
  – Miles flown,
  – Passenger-miles flown.

• Example Canadian accident rate data
Choice of exposure data-2

Accident rate per flight hour

- Airliners
- Commuter

avg. flight 45 minutes

avg. flight 2.2 hrs

source: TSB Canada
Choice of exposure data-3

Accident rate per flight


Airliners
Commuter

x10^-6
• Example: Major airline,
• Rate of unstable approaches (from FDM),
• Large scatter in the SPI per a/c type.
Jumping SPIs-2 (unstable approaches)

Per 1000 landings

95% confidence bands
Jumping SPIs-3 (unstable approaches)

Smaller 95% confidence bands

per 1000 landings

[Graph showing quarterly data from Aug-96 to Feb-99 with confidence bands for each quarter]
Incident reporting system at an airport

160 reports per month from:

- Airlines
- ATC
- Ground handling
Major data provider started underreporting certain events.

Trend?
• SPIs are not smart!
• You can make them smart
  – Selection of exposure data
• Example runway incursion rate versus crossings
Smart SPIs-2: Runway incursion rate versus crossings

Overall incursion rate: 4 per 100,000 movements

- 25% of all incursions
- 5% of all movements

Incursion rate: 20 per 100,000 crossings
Final remarks

- SPIs are just one of a larger set of tools to assess operational safety performance

- SPIs do not replace commonsense
Those boring numbers do have a meaning....