Deriving Safety Metrics
From data to intelligence

Eric Kruijzen
Flight Safety Manager
KLM

The Hague
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Current Incident-based Safety Info: Data

Topic: EGPWS (incl. total prev year)

- Small risk
- Medium
- High
- Substantial
- Previous year

Data

19-04-2013
Operational Drift

Focus on small signals

Operational Drift

Incident

As used in practice

Design Specification

$t=0$
Bill Voss — Flight Safety Foundation

1. What is most likely to be the cause of your next accident or serious incident?
2. How do you know that?
3. What are you doing about it?
4. Is it working?

- Simple to answer if we have an effective SMS
- Impossible to answer if we don’t

Source: Aero Safety World dec11-jan12
Transition to **Risk Based** Safety Assurance & Change Management

- Need for a sensible representation of
  - risk
  - potential failure of measures taken to control risk
- Need to look for “small signals”
- Wish to use (much) more data from operation

- Need to transform data into **intelligence**
Bow Tie as a Risk Model

**Hazard**: potential (negative) energy

**Threat**: tries to release (energy in) hazard

**Top Event**: when one starts to lose control over hazard

**Preventive Barriers**: aim at preventing Top Event from happening

**Outcome**: aim at minimising damage once Top Event has happened

**Recovery Barriers**: aim at minimising damage once Top Event has happened

**New Location**: Top event

**Risk**
Example

Stabilised Approaches vs Overrun Risk

• ALAR TF reasserted need for Stabilised Approaches
• Criteria are seen as precursors for underlying risk: overrun (a.o.)
• Focus on Stabilised Approach Criteria ≠ risk
Risk-based Safety Performance Metrics

- Approach and landing manoeuvre & crew actions “peeled back” to reveal underlying risk

- Stabilised Approach Criteria are part of barrier performance; Risk indicates Barrier “non-performance”

- Both are needed for proper risk-based safety mgmt!

- For overrun risk: Focus on kinetic energy; stopping performance vs runway available.
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</tbody>
</table>

**Data from All Landings...**
Safety Risk Metrics

Overrun Criticality
Remaining Distance at speed = 0 knots

Top 5 Critical Runways
Mapping Safety Risk Metrics to the risk model

Deriving Safety Metrics – version 1 - EKr

19-04-2013
Operational Bow Tie
Practical Implications of Risk-based metrics

• Need for a proper risk model (or else: failure)
• Introduction of Criticality = measure of margin to limit; based on KLM Risk Matrix
• Barrier Performance made up of several criticalities
• Enormous amounts of data required – introduction of advanced statistics
• Qualitative intelligence required – quest for data gathering and analysis methods
• New input sources required

Risk model to be used for
• Safety Assurance; and
• Change Management