Safety Performance Indicators (SPIs) for Advanced Air Mobility (AAM)

European Rotors

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Cologne, Germany

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International Federation of Airworthiness

Zero Accidents

Urban helicopter fatal accidents - findings

- Contributing to this accident were XYZ's deficient safety management, which did not adequately mitigate **foreseeable risks**,

- Both the mechanic's performance and the inspector's performance probably were degraded by **fatigue**,

- Safety **oversight** activities of ABC were not sufficient to reveal the large number of safety deficiencies in XYZ, especially in maintenance,

- Both engines flamed out due to **fuel starvation**, about 32 seconds apart, as the helicopter was returning to XYZ City Heliport,

- The "**inherent limitations**" of the see-and-avoid concept.

Why don't we hit the target?

Even if we were prefect we would still have to address:

- Foreseeable but accepted risks*
  - < extremely improbable occurrence
  - Reasoned societal norms
  - High utility exceptions
  - Human error: noise and bias
- Unpredictable factors
  - Unaccounted risks
  - Undocumented or events beyond current knowledge
  - Inconceivable occurrences
  - Human malice

  - *Known knowns & unknowns

Top-Down: What can go wrong?

Fatal accidents – humans are vulnerable

- High energy impact
    - With structures, terrain or water
    - With other airspace users
    - With debris from failures
- Uninhabitable environment
    - Smoke and fire
    - Electrical shock, including lightning
    - Explosion
    - Drowning
- Grossly bad behaviour
    - Disregard, including medical incapacitation
    - Ignorance and malevolence
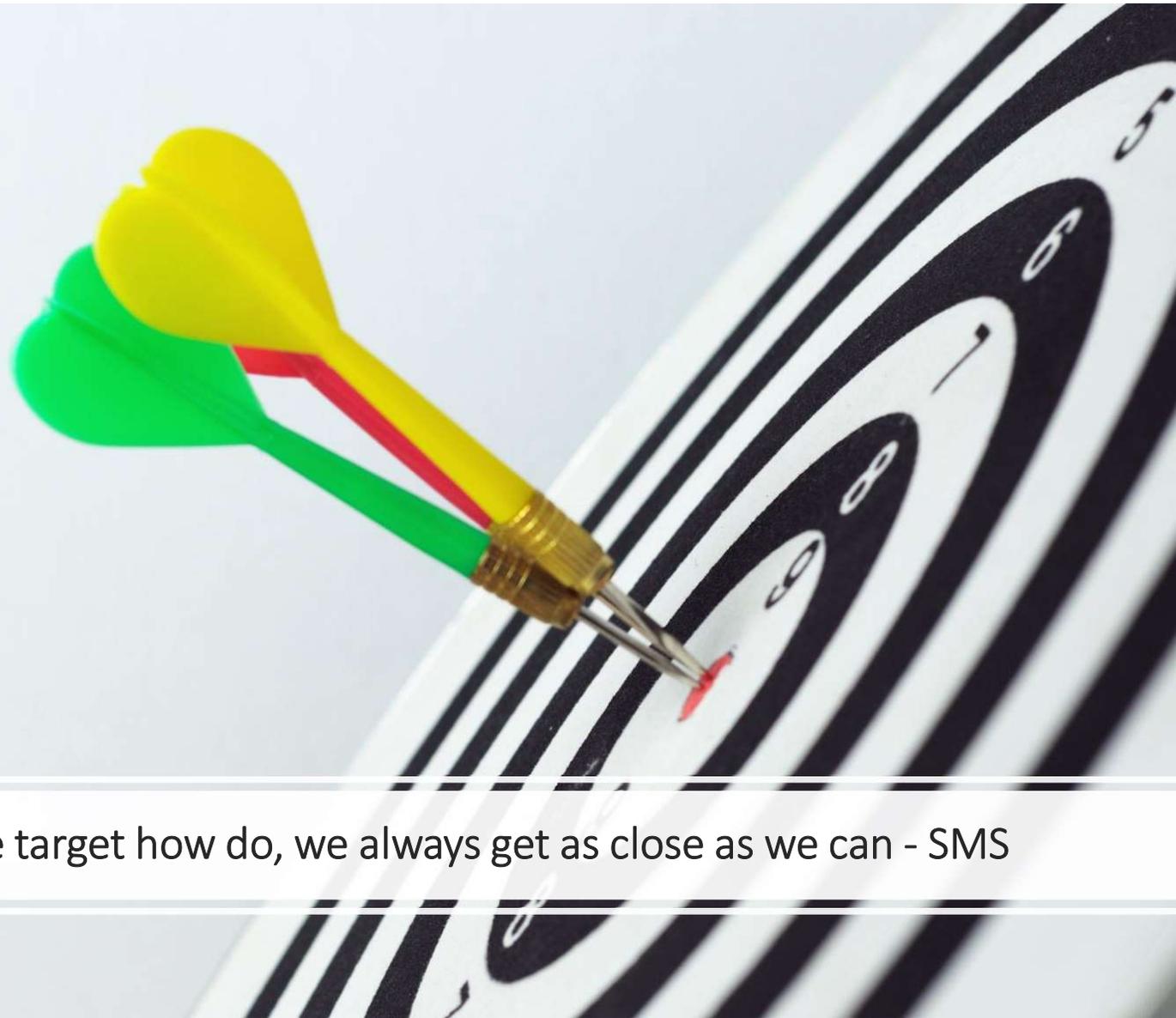
If we can't always hit the target how do, we always get as close as we can - SMS

Universal SMS

AAM/UAM

Know your risks; do something about them; check it works

Safety Assurance

Safety Performance

A service provider´s safety achievement as defined by its safety performance targets and safety performance indicators

Safety Performance Indicator (SPI)

A data-based parameter used for monitoring and assessing safety performance

What is the role of a Safety Manager?

The Safety Manager is the focal point

This can include implementing and/or managing an organisation's safety management system (SMS)

- Monitoring the effectiveness of a SMS;
- Initiating corrective and preventive actions;
- Delivering information on safety performance;

For AAM/UAM within a System of Systems:

Multimodal public transport requires cooperation/collaboration/coordination C^3

Indicator building blocks

- Accident and Incident Data
- Occurrence Data
- Operational Flight Data Monitoring
- Voluntary Reporting
- Safety Audit Findings
- Maintenance Data
- Authorities Data
- Cooperative Data Sharing

Data Pyramid & Value

Wisdom & Knowledge

context data/information

raw unstructured data
multiple sources / multiple owners

Data Pyramid & Cost

Intelligence needed (rare)

Dedicated resources needed

Acquisition needed (abundant)
Monetised data ?
Intellectual Property (IP) ?
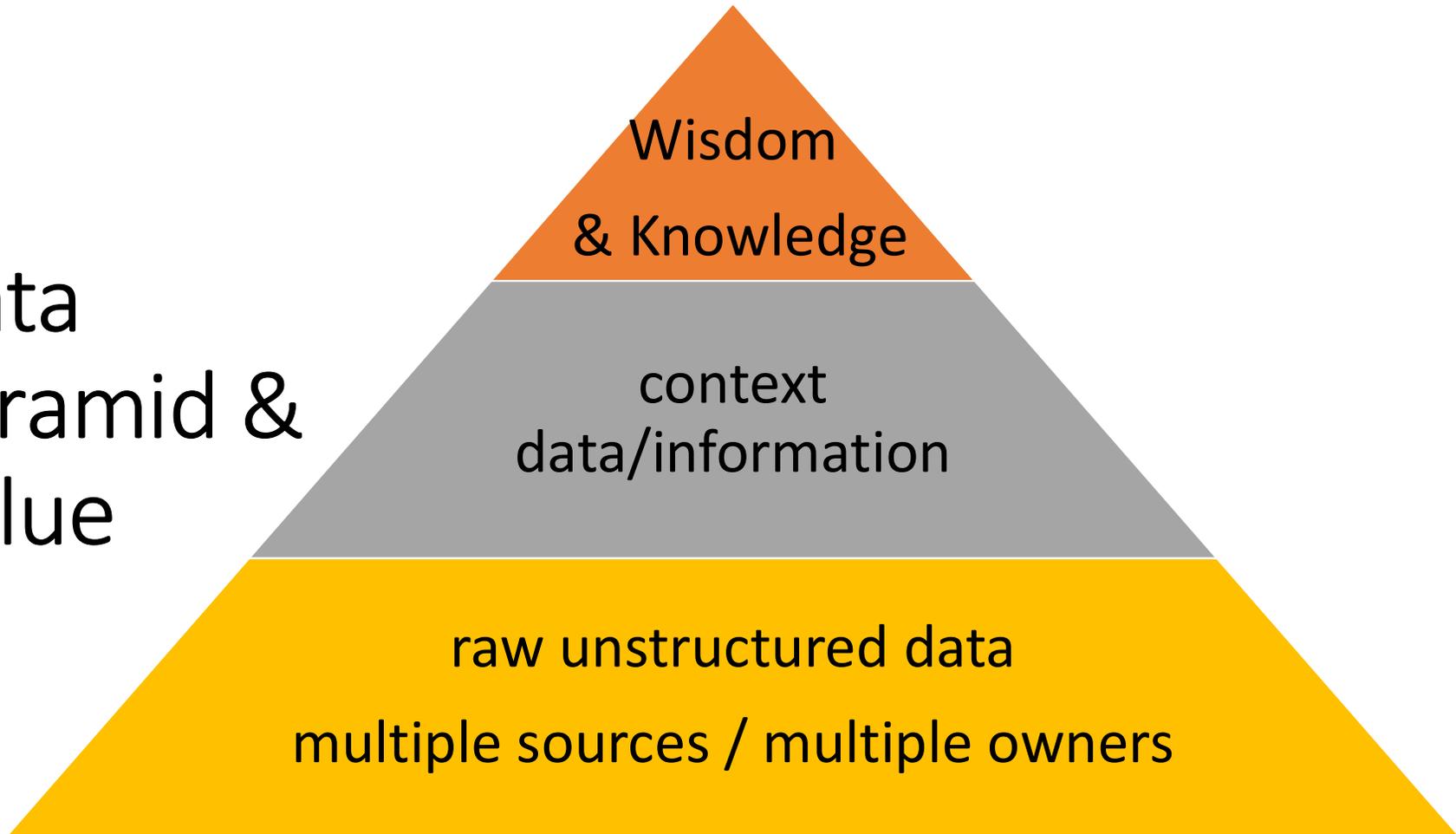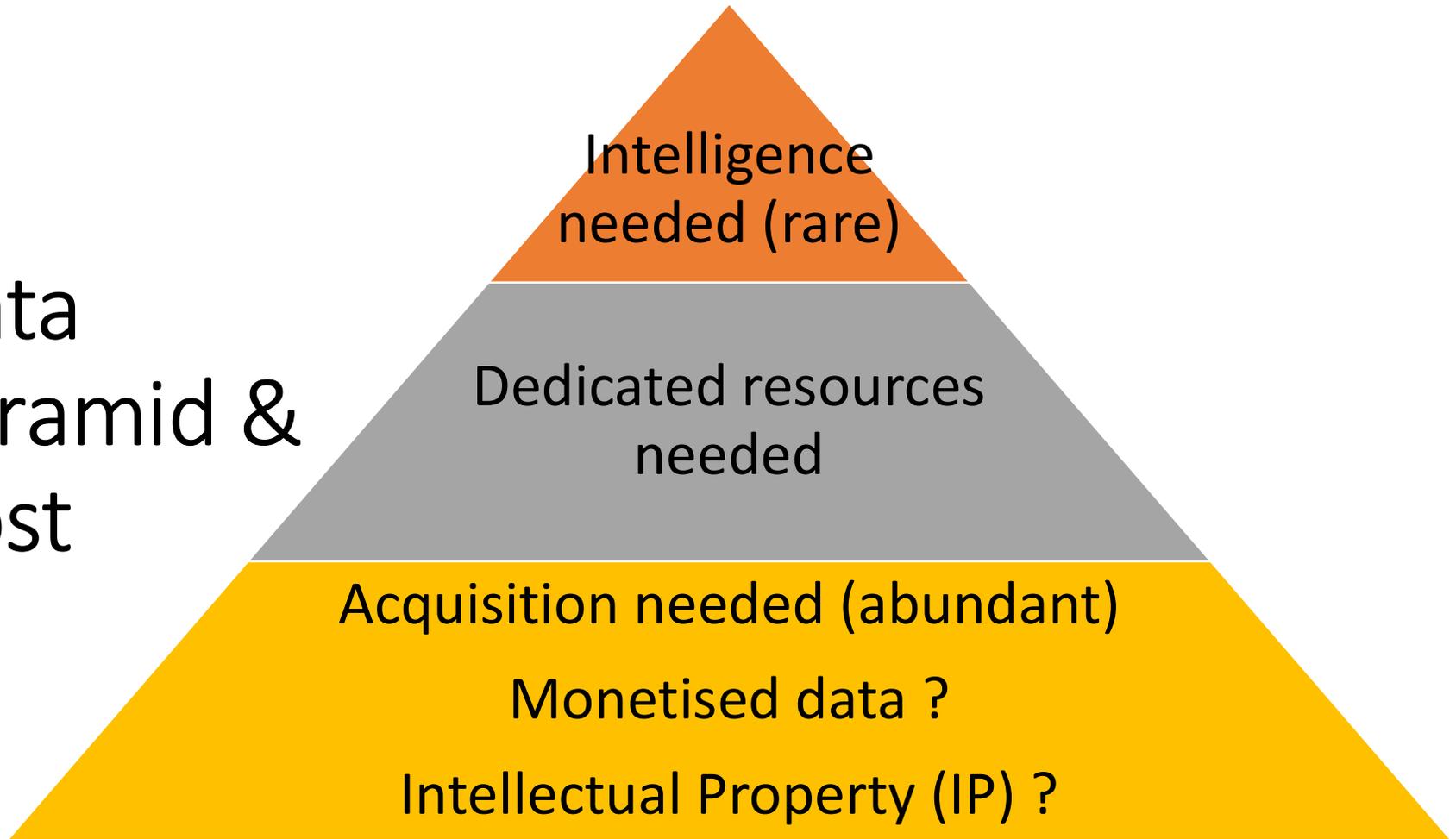
Rates

Rates facilitate practical comparisons

- **Numerator** – straightforward
  - Reportable Events/Outcomes (accidents/incidents/occurrences)
  - Factors (anomalies/failures/errors)
  - Procedures (emergencies/diversions/reversions)
- **Denominator** – multiple choices – exposure
  - Per hour
  - Per km
  - Per flight / sector /cycle
  - Per phase of flight / transition
  - Per system
  - Per pax
  - Per charge / discharge or fuelling

How do we make effective indicators?

- What types of exposure data will be required, and what exposure data is available?

- How should safety indicators be presented, what periods should be covered?

- Can industry harmonisation benefit wide ranging types of operations?

What might SPIs look like?

Tier 1 – AAM / UAM

accident and serious incident rates

Tier 2 – Landing Excursions

excursion rate

flt. control mod uptakes

Tier 3 – Contaminated Sites

Unobserved lighting / signage / markings

Incidents involving high winds
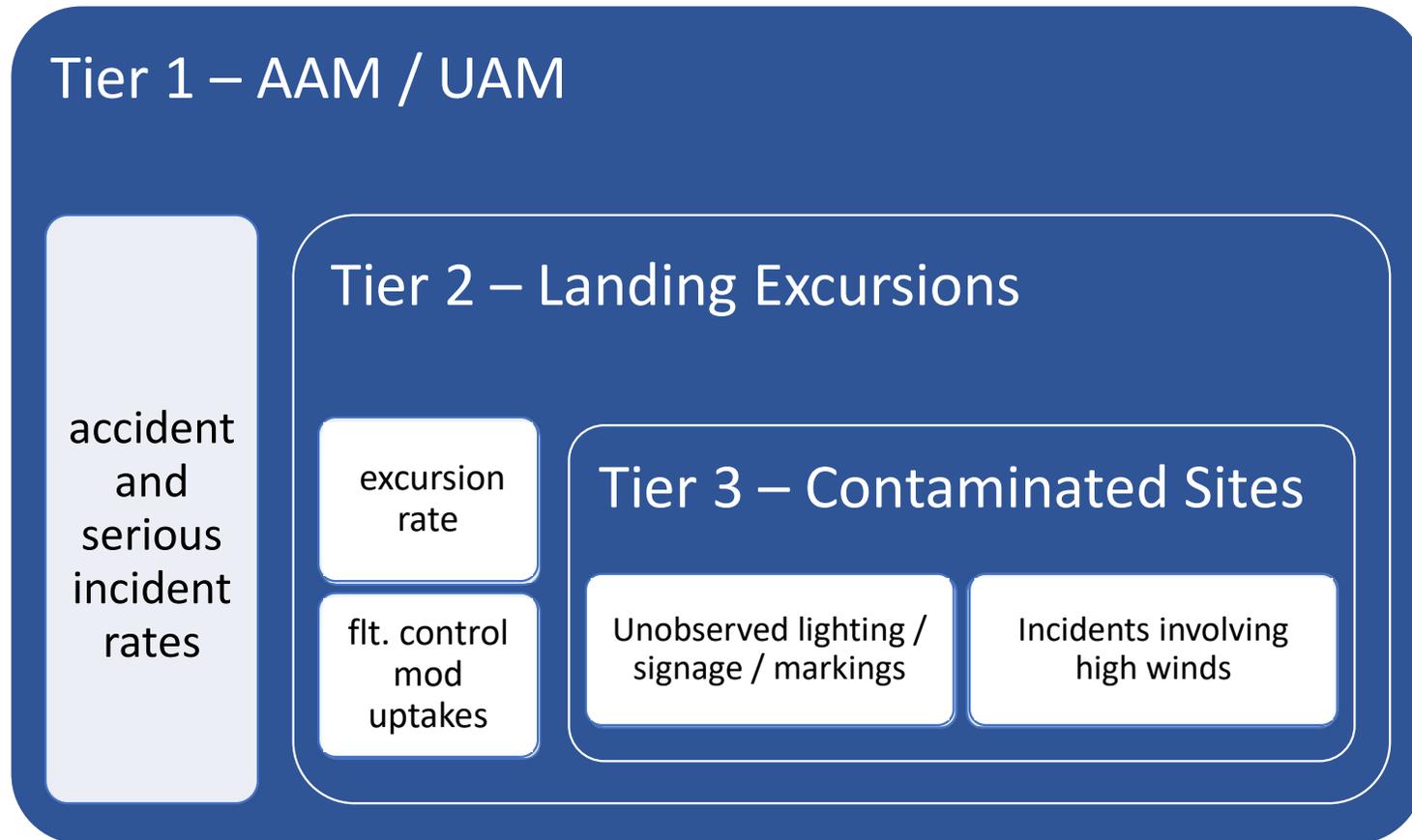
Useful for complex integrated systems

- Major parts repair/replacement rates
- No Fault Founds (NFF)
- Reset rates
- Sensor errors (GIGO)
- Corrective action rates
- Numbers of workarounds

Remember neither automation nor analysis can add information which is not in the data

Who are the users of safety indicators ?

- Industry
  - Operational
  - Managerial
- Public
  - Users – pax
  - 3rd parties
- Government
  - Transport directorates
  - Politicians
- Research

Brief Summary

- Universal SMS
- New type of Safety Manager
- Harmonisation of SPIs
- Confidentiality challenges
- Cooperative safety data sharing – industry led?

Safety isn't a statement – it's an activity

Thank You

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Remember - It doesn't matter how accurately you address something that's irrelevant.

-Anonymous