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HOW DO WE MEASURE SAFETY (PERFORMANCE) IN AVIATION?

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Aviation Academy

Flight Safety Symposium,
26-27 September, London
Heathrow

CREATING TOMORROW

CHALLENGES FOR AVIATION COMPANIES

- **Small – Medium Enterprises:** lack of adequate safety/operational data to monitor safety
- **Large companies:** operational/safety data available, but they need metrics of better quality
- **How to move** from compliance-based to performance-based monitoring?

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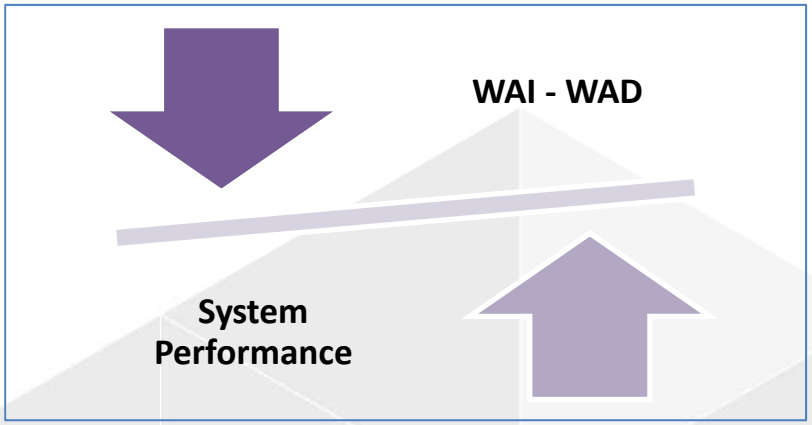
PROJECT PHASE 1 RESULTS: CURRENT SITUATION & PRACTICE

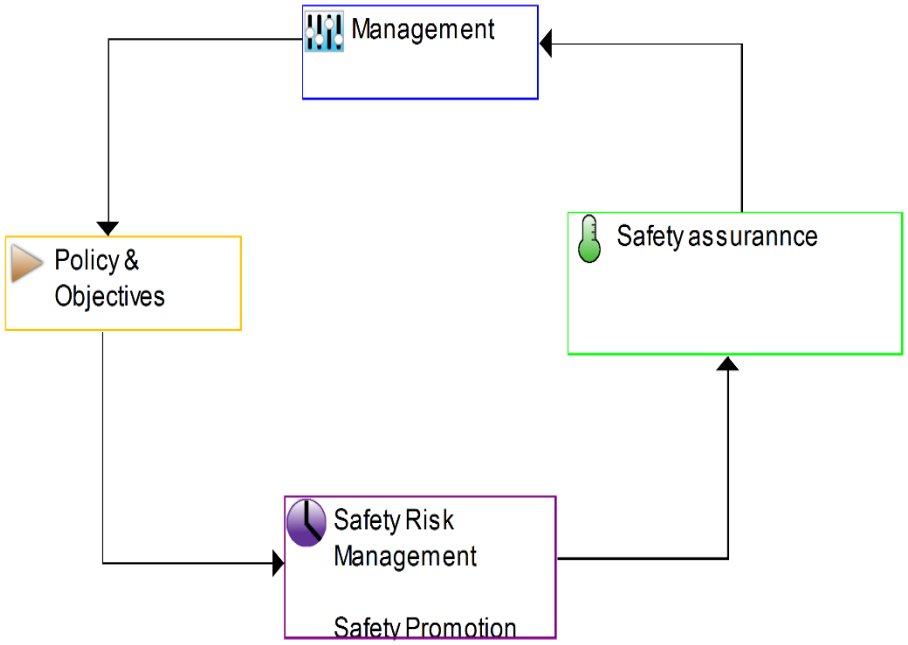
- **Safety metrics can be split into two groups:** safety process and safety outcome metrics
  - **Safety process metrics (proactive):** mostly compliance-based and SMS activities volume-based approaches
  - **Safety outcome metrics (reactive):** ambiguity in thresholds of (serious) incidents does not allow their reliable and uniform use in safety performance measurement
- **Current safety metrics** lie on the safety viewpoint adopted, mainly linear
- **There is no proven consistent relation** between metrics of safety processes and outcomes
- **No quality criteria** are used for developing safety metrics

PROJECT PHASE 2: THE PRINCIPAL CONCEPT



- In practice, the industry considers the gaps, **but we haven't uniformly depicted/measured those and searched** for their effects
- We will focus on the gap; we do **not claim authenticity of either WAD or WAI**
- **Operationalisation of concepts** discussed but not yet used
- **Safety is not the only system objective**

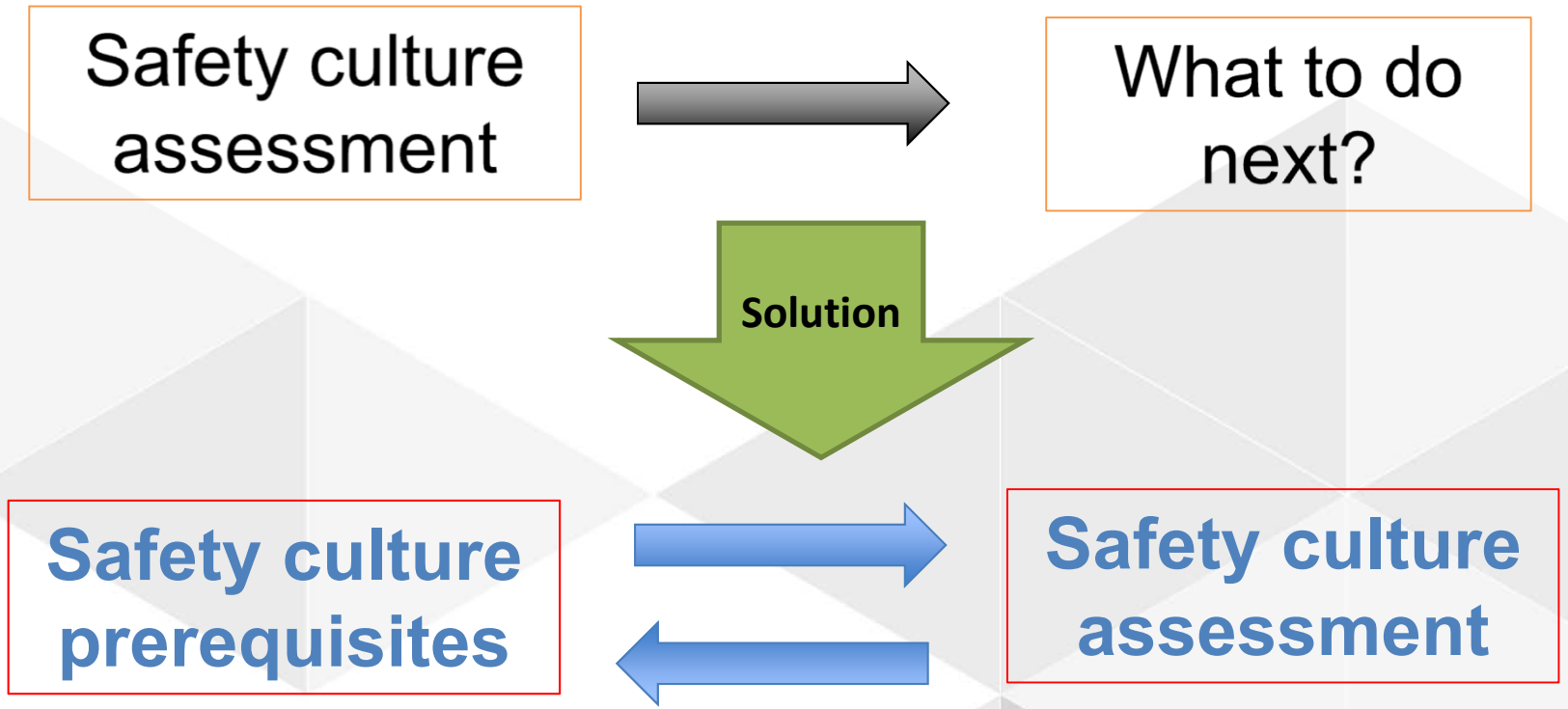
METRIC 1: SMS ASSESSMENT TOOL



- **Step 1**: SMS functioning – Design and Implementation (Documentation, Actions & Dependencies)
- **Step 2:** Why SMS does not function well
- **Step 3:** Why SMS functions well but does not "deliver"

SMS assessment tool that includes check points and scoring

METRIC 2: SAFETY CULTURE PREREQUISITES (SCP)



- SCP tool (Plans and Actions) & SC assessment
- Includes scoring per safety culture area and level

METRIC 3: SYSTEM COMPLEXITY

- Complexity cannot be fully understood
- Literature suggests various approaches to "measure" complexity for specific applications
- Our system complexity metric combines:
  - Number and timestamp of elements
  - Number and types of interactions
  - Resource slacks
  - Perceived complexity

METRIC 4: RISK CONTROL EFFECTIVENESS (WHEN DATA AVAILABLE)

$$Indicator\ 1: \frac{total\ failures\ of\ the\ risk\ control\ measure}{total\ contacts\ with\ the\ risk\ control\ measure}$$

$$Indicator\ 2: Percentage\ of\ failures\ when\ inspected\ or\ tested$$

$$Indicator\ 3: \frac{Times\ hazard\ escalates\ after\ the\ risk\ control\ was\ in\ place}{Times\ hazard\ escalates\ before\ the\ risk\ control\ was\ in\ place}$$

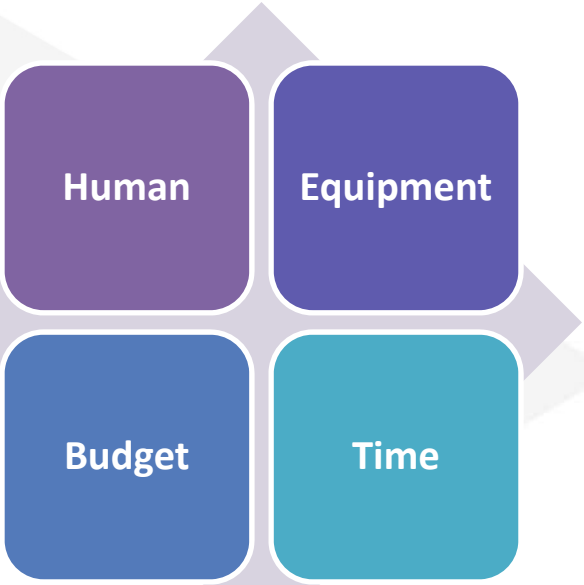
Current work: Consolidation of indicators in a single score

METRIC 4: RISK CONTROL EFFECTIVENESS (WHEN DATA UNAVAILABLE)

Functionality (Hollangel, 2004)	**Score**	**Hierarchy of controls (Leveson, 2011)**	**Score**
Physical	4	Elimination	4
Functional	3	Prevention	3
Symbolic	2	Reduction	2
Incorporeal	1	Mitigation	1

METRIC 5: RESOURCE UTILIZATION

Resource types



Possible gaps

Designed (system architect/authority)	Strategical level (planned - 1)	Tactical level (planned - 2)
Operational level (planned - 3)	Operational level (needed)	Operational level (available)
	Operational level (used)	

THE RIGHT PART OF THE EQUATION: SAFETY OUTCOMES

- Where applicable, in addition to safety we will consider outcomes of other system objectives (e.g., quality, productivity, efficiency).
- All mandatorily reported safety occurrences will be considered as safety outcomes, because:
  - Same hazards and risks can lead to various types and severities of consequences
  - Actual outcomes are deterministic and do not consider the potential of low severity events to escalate to ones of higher severity

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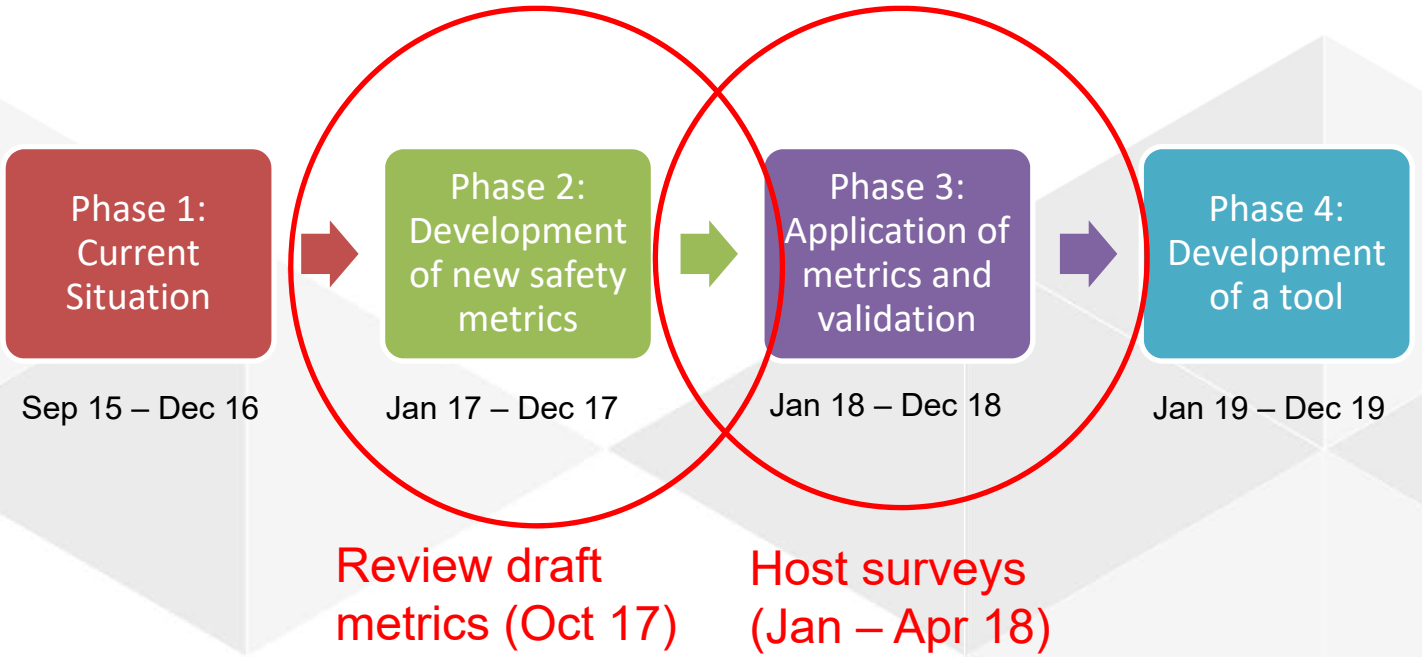
WORKING WITH AND FOR THE INDUSTRY



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WHY JOINING US?

- **Get a better understanding of your own operations** across the five focus areas of the metrics
- **Get access to benchmarking results** against other high-performing aviation companies participating in the project
- **Become a pioneer** in introducing performance based metrics to complement compliance with aviation standards
- **Demonstrate your commitment** to safety innovation
- **Show your leading role** in improving safety proactively

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APPRECIATING OUR PARTNERS

- **Acknowledgment of contribution in technical reports** and international publications and presentations
- **Upload of company logo** on the website of the research project
- **Participation in the annual project meeting** to exchange views and jointly drive the research to the right direction
- **Free inhouse workshop on a selected topic** during surveys for application of metrics
- **Reduced registration fees** for the Aviation Academy events and master classes

BUT ABOVE ALL BENEFITS…

because improving safety is our social responsibility!

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INTERNATIONAL CROSS-INDUSTRY SAFETY CONFERENCE (ICSC)
1-3 NOVEMBER, AMSTERDAM

- Dedicated to both practical and theoretical aspects of safety
- Platform to disseminate and share knowledge and experience about safety within and between industry and academia
- This year's theme is "Work-as-Imagined and Work-as-Done: Balancing Rules and Reality"
- The program will feature 2 keynote speeches, 23 presentations and 6 posters around a variety of topics.

www.amsterdamuas.com/icsc

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PROFESSIONAL MASTER CLASSES 2018

- Safety & Human Factors, 15-19/1/2018, (www.amsterdamuas.com/hfs)
- Risk Assessment, 12-16/3/2018, (www.amsterdamuas.com/mcra)
- Incident Investigations, 16-20/4/2018, (www.amsterdamuas.com/mcii)

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MANY THANKS TO THE CONTRIBUTING ORGANISATIONS AND INDIVIDUALS SO FAR!

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Questions?

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