



Horizontal Smoke Velocity Characterization for Artificial Smoke Generators

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Motivation

Background

- Due to health and safety concerns – artificial smoke generators are used for inflight certification testing
- Smoke generator aerosols must be similar to real smoke for the false alarm resistant smoke detectors to alarm
- Standardizing the artificial smoke generators is necessary to ensure the reliability and integrity of the inflight smoke detection certification test

Source:

M. Karp,
Smoke Generator Standardization
for Certification Testing
The Ninth Triennial International
Fire & Cabin Safety Research
Conference,
Oct 30 2019



4

Motivation

Today's standards



- Flight tests are performed with different smoke generators
- The test programme is agreed in advance with airworthiness authorities
- Different aircraft manufacturers use different smoke generators and different modes of operation



Standardisation is required!

Velocity

Particle size

Refractive index

Ambient Temp

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6

30 Oct 2019

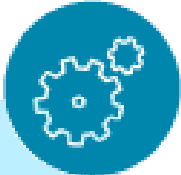
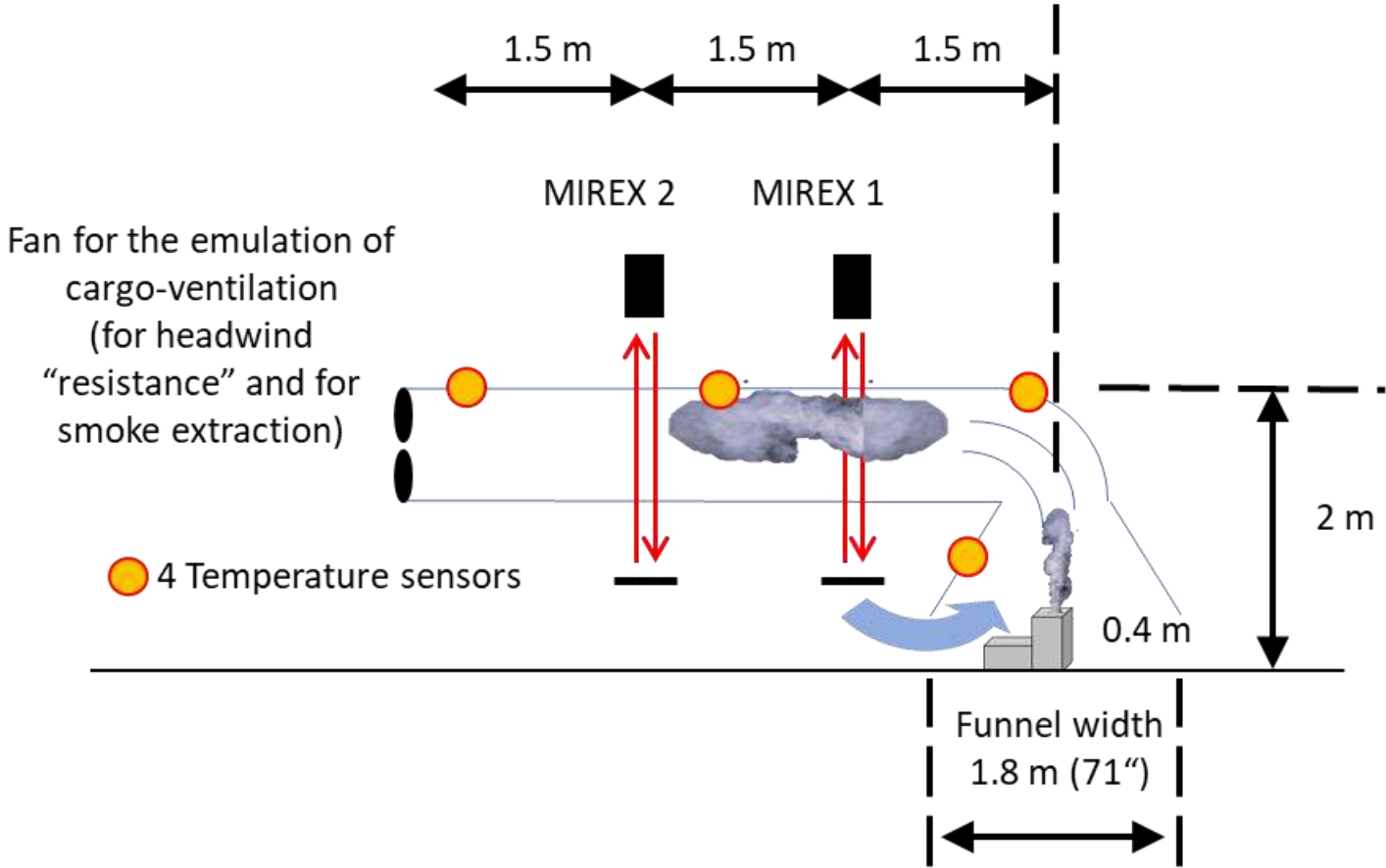
Certification of Smoke Detection Systems in Aircraft - Triennial Fire Safety Conference 2019 Atlantic City

AIRBUS

Source:
A. Freiling,
Certification of smoke detection
systems in aircraft,
The Ninth Triennial International
Fire & Cabin Safety Research
Conference,
Oct 30 2019

The last piece of the puzzle: Horizontal smoke velocity test

Goal: Simulation of smoke spreading at cargo ceiling

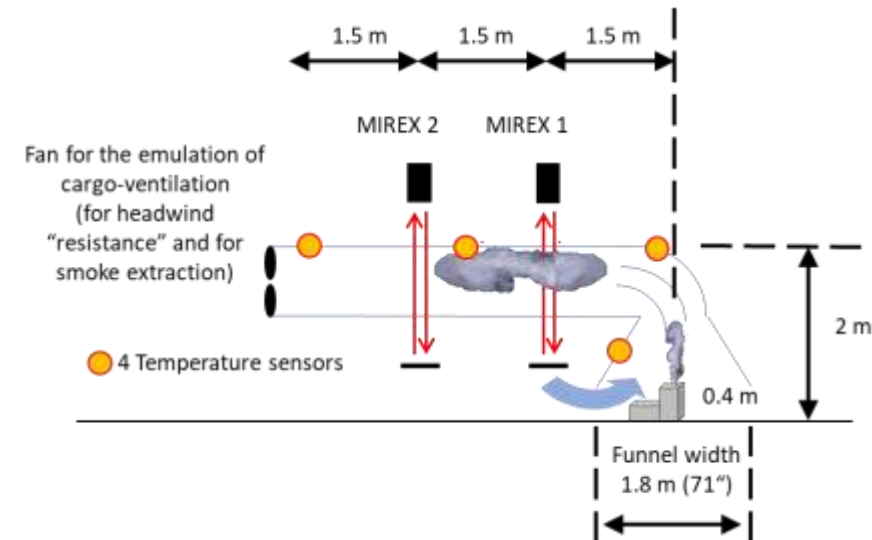
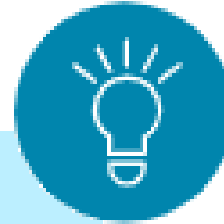


Technical data:

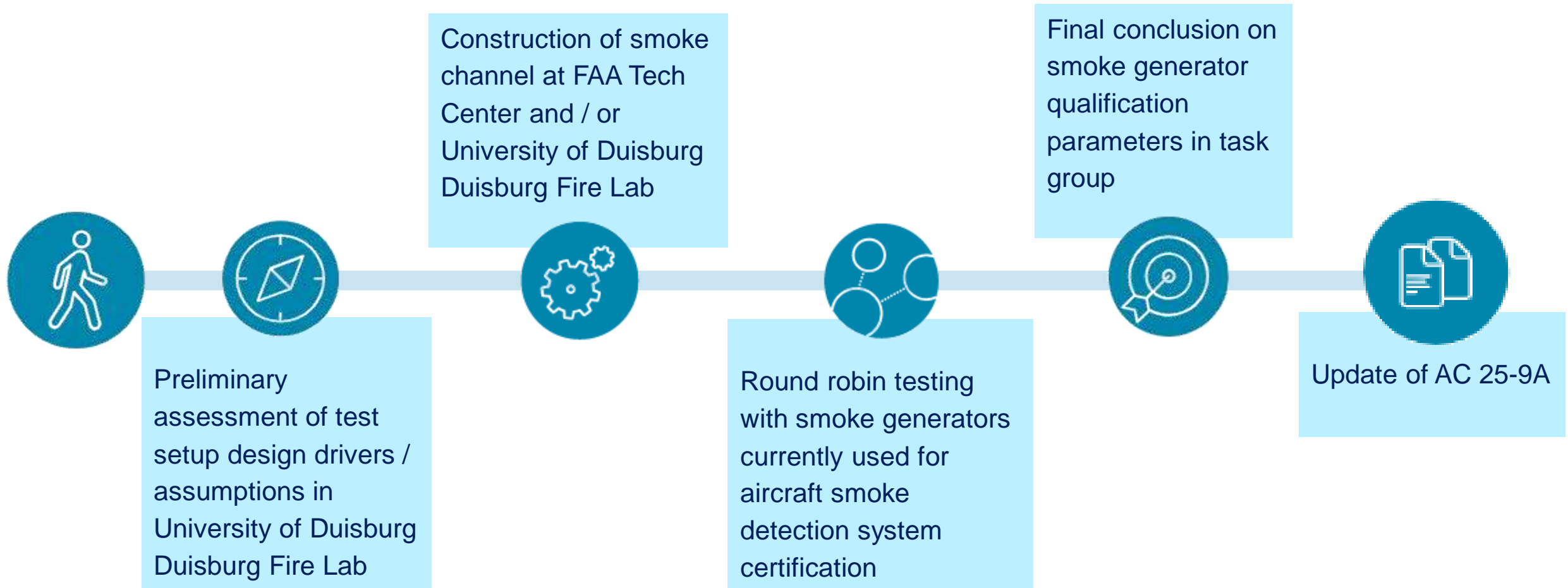
- Duct cross-section 0.8 m x 0.8 m
- Height of funnel: 0.8 m
- Cross-section at the funnel opening: 1.8 m x 1.8 m
- Volume of the funnel (incl. duct above): about 1.8 m³.
- Funnel half opening angle: 32°.

Design drivers/assumptions

- Dimensions should reflect reality: Cargo compartment height appr. 1-2m, distance between smoke detectors 1-3 meters.
- Duct cross-section 0.8 m (31.5"): Should be smaller than max MIREX size (1 m) AND as large as possible, reducing drag
- Vertical MIREX mounting prevents incorrect interpretations due to possible stratification.
- A fan simulates air flow caused by the aircraft ventilation system (headwind "resistance"): TBC during Test setup suitability assessment
- Temperature sensors adequately distributed
- Curves of the channel equipped with deflection plates to achieve as laminar flow as possible



Way forward



Acknowledgements

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Thank you