Presented by

Kai Behle
Systems Engineer

Standardisation of False Alarm Rejection Capability Assessment

- Proposal -

AIRBUS

Contents

- Motivation
  - ▸ False Alarms in Aeronautics
  - ▸ False Alarm Rejection Tests in Lab and on Aircraft
  - ▸ Reference: Standardisation of Detection Performance Testing
- Standardisation Proposal
  - ▸ False Alarm Rejection Ratio: Equation
  - ▸ False Alarm Stimulus Test Chamber
- Outlook and Summary
- Discussion

Motivation

- **Increasing demand** for false alarm rejection in aeronautics and standardisation of test methods.

- Smoke detection **minimum performance standards** are stringently defined for aeronautical applications, whereas false alarm rejection performance is not.

- Intention: "False Alarm Rejection Ratio" as an **objective value** for rejection capabilities assessment of fire-/smoke detectors.

→ Airbus proposes a new standard on the following slides
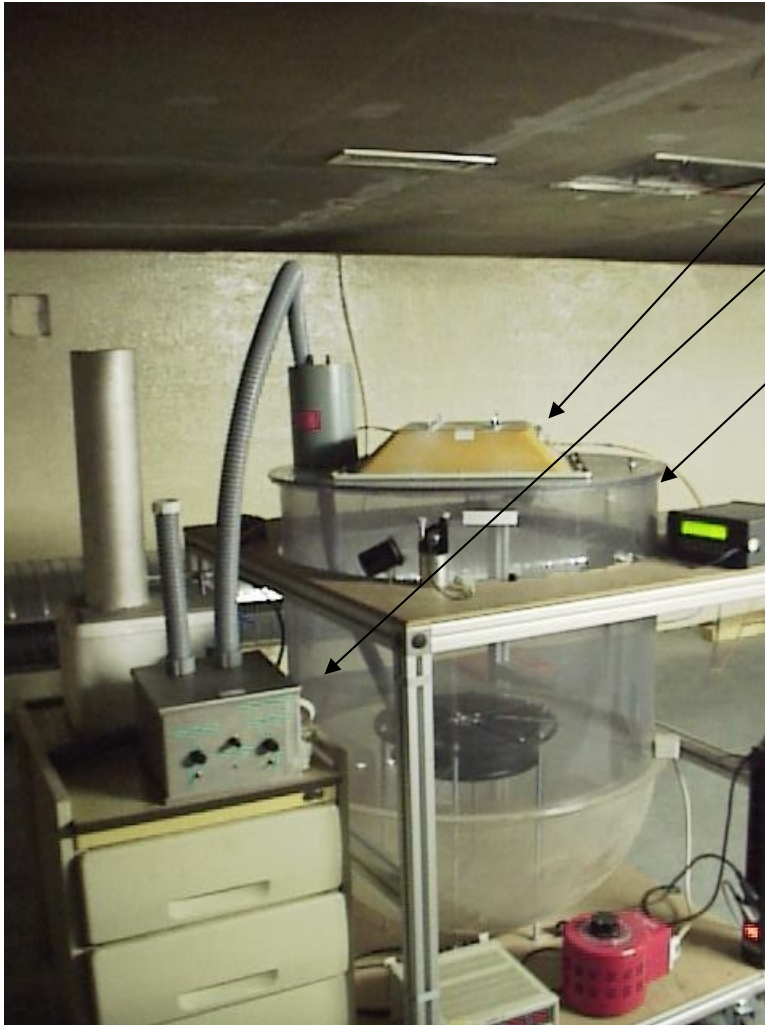
False Alarms in Aeronautics

- Relative high false alarm rates in aeronautical smoke detection applications of up to 180:1

→ Multi-criteria smoke detectors developed with SIEMENS in the context of research program FireDetEx have been successfully introduced on Airbus A380.

AIRBUS

False Alarm Rejection Tests in Lab - Examples

Haze & Dust Test Chamber:

Smoke detectors in A380 cavity

Ultrasonic fog generator

Test chamber with fan

Nuclei Fog Test Set-Up:

False Alarm Rejection Tests on Aircraft

- To assess the false alarm rejection performance of the A380 smoke detectors, several tests were conducted on aircraft:

"Salad-Campaign" conducted on flight to Singapore

AIRBUS

Reference: Standardisation of Detection Performance Testing

- Standards for sensitivity of smoke detectors to detect a fire are well defined, e.g. EN54 defines the fire types as well as the smoke levels to be detected

- ‣ Smouldering wood
- ‣ Smouldering cotton
- ‣ Flaming polyurethane
- ‣ Flaming n-heptane

→ Long tradition and good sophistication of performance test standards

False Alarm Rejection - Standardisation Proposal

- So far, unlike for smoke detection performance, false alarm rejection testing conducted by Airbus and its suppliers was only based on comparisons to standard optical smoke detectors.
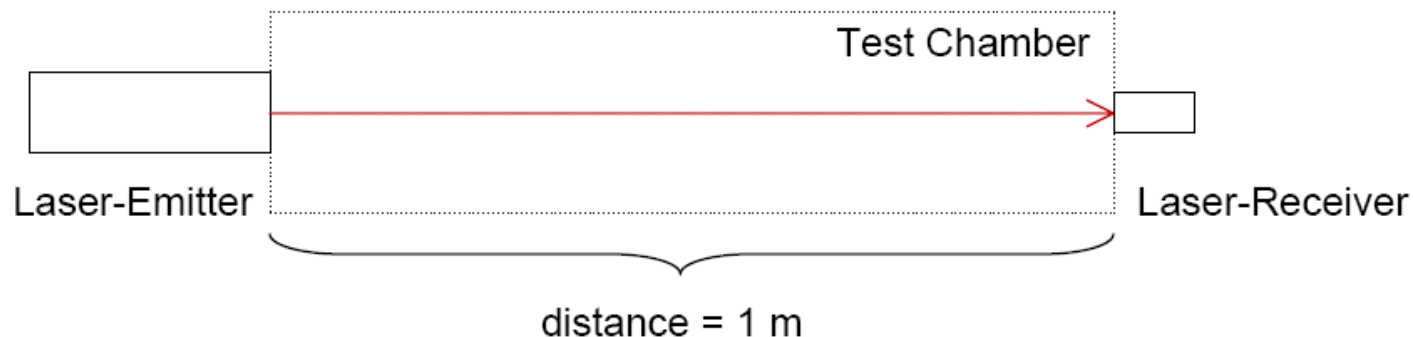
→ Proposed "False Alarm Rejection Ratio":

   Ratio of the smoke detector response to a

   - false alarm stimulus to

   - a real smoke scenario stimulus

   which should be determined in a standardised environment.

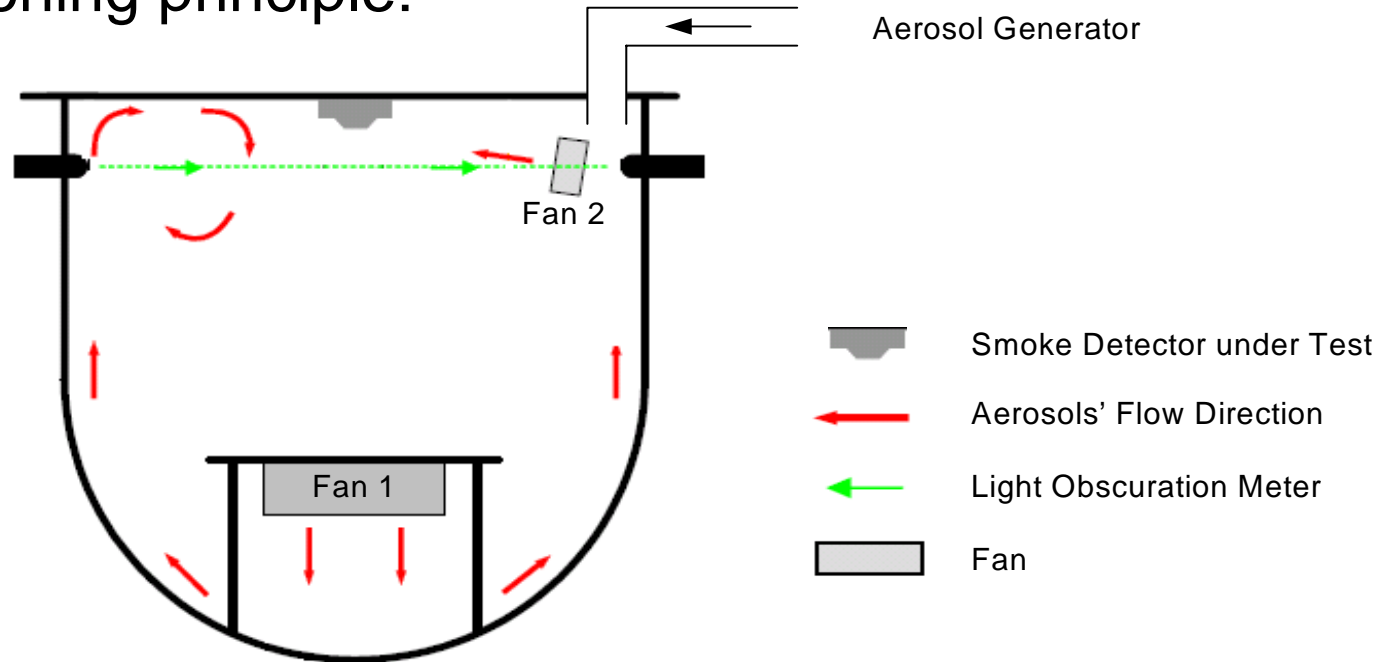- Reference Value: Light Obscuration (in %/m) at Alarm:

Test Chamber

Laser-Emitter → Laser-Receiver

distance = 1 m

False Alarm Rejection Ratio: Equation

$$R = \frac{LO_{amb} \ (\text{False Alarm})}{LO_{amb} \ (\text{Real Alarm})}$$

False Alarm Rejection Ratio

with:

R: False Alarm Rejection Ratio

LO_{amb} (False Alarm): Externally (ambient) measured light obscuration (in %/m) at transit to alarm caused by false alarm scenario.

LO_{amb} (Real Alarm): Externally (ambient) measured light obscuration (in %/m) at transit to alarm caused by real alarm scenario (e. g. EN54-7 test fire).

False Alarm Rejection Ratio: Test Chamber

- **Functioning principle:**

Aerosol Generator

Fan 2

Smoke Detector under Test

Aerosols' Flow Direction

Light Obscuration Meter

Fan

Fan 1

Targets:

- Homogenous distribution of aerosols throughout chamber

- Continuous increase of aerosol concentration

- Application of various stimuli: dust, fog, smouldering wood etc.

False Alarm Stimulus Test Chamber - Examples

Test chamber invented by SIEMENS

Test chamber of University Duisburg

False Alarm Rejection Ratio: Outlook

- False Alarm Rejection Ratio could be determined for different false- and real-alarm-scenarios in a standardised test environment.

- Outlook: Minimum false alarm rejection ratio values could be specified in fire-/ smoke detector specifications for **e. g.**

  R = 8 for
  - standardized mineral dust according to ISO12103-1 vs.
  - EN54 TF2 (smouldering wood),

  R = 5 for
  - standardized mineral dust according to ISO12103-1 vs.
  - EN54 TF5 (n-heptane, flaming).

Summary

- Motivation: **Increasing demand** for standardisation of test methods reflects the progress achieved regarding false alarm rejection.

- Intention: "False Alarm Rejection Ratio" as an **objective value** for rejection capabilities assessment of fire-/smoke detectors.

- Next steps: Definition and **standardisation** of
  - procedure to obtain the value,
  - test environment,
  - and measurement equipment.

→**Airbus is willing to support a standardisation committee**

Questions and Feedback?

AIRBUS

AN EADS COMPANY