International Aircraft Systems Fire Protection Working Group Meeting
11 – 12 May 2011

Smoke Detector False Alarm Rejection Standard

Presented by
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AIRBUS

SMOKE DETECTOR CHALLENGES

FIRE and SMOKE DETECTION

Nuisance resistance

CERTIFICATION

FALSE ALARM REJECTION RATIO

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

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).

Actual Status on Test Procedure Development

In collaboration with University Duisburg-Essen

FIRE TESTING

TF 2 EN54 TF 5

DUST TESTING

2 air velocities:
- 0.2 m/s
- 1 m/s

2 dust types:
- Dolomit <90µm
- Cellulose

AEROSOL TESTING

Deodorant
Insecticide

FOG TESTING

Summary

With the currently developed test procedure, the following smoke detector characteristics can be obtained:

8 dust indices:
2 dust types vs. 2 fire types vs. 2 air speeds

4 aerosol indices per spray interval:
2 aerosol types vs. 2 fire types

SMOKE DETECTOR CHALLENGES

- False alarm rejection performance is not standardized.
- There is a demand for false alarm rejection assessment in aeronautics and building application
- False Alarm Rejection Ratio is an objective value for rejection capabilities assessment
- A standardized test setup and procedure is introduced.

FIRE and SMOKE DETECTION

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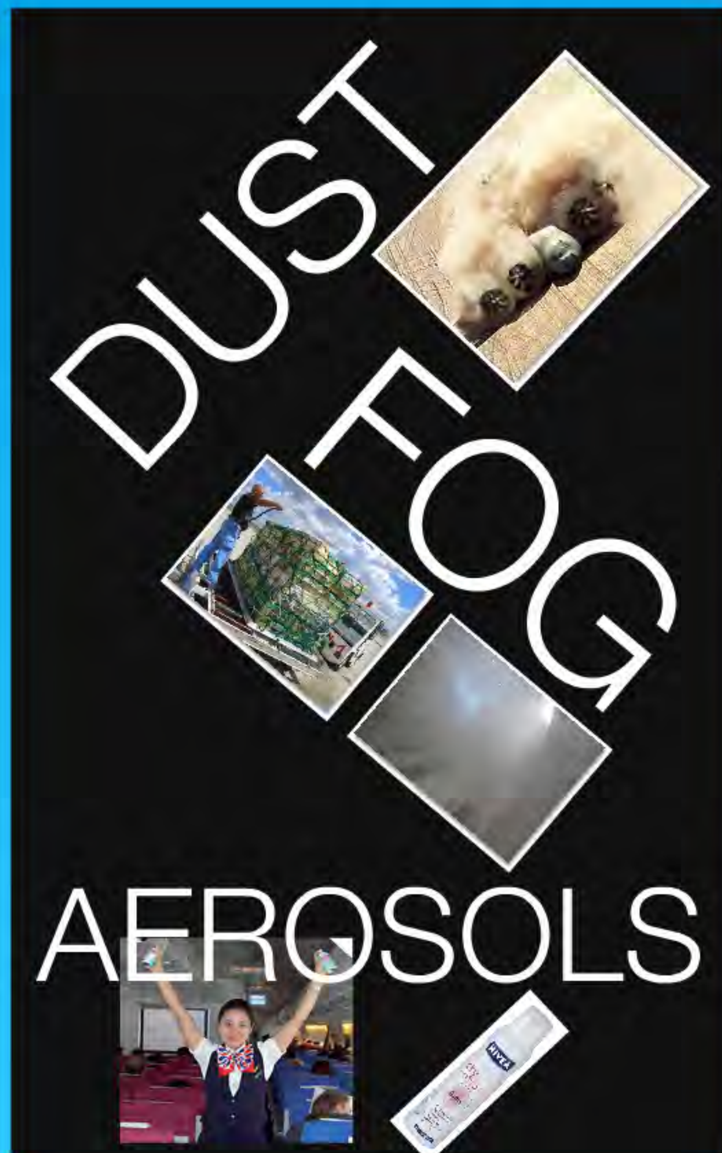
DUST
FOG
AEROSOLS


Smoke Detection Flight Test
in a class C MDCC

FALSE ALARM REJECTION RATIO

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FIRE TESTING

white smoke
"cold"

no smoke
"hot"

TF 2 EN54 TF 5

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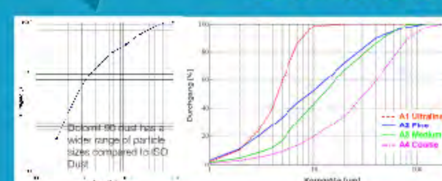
WHY?




100.0
10.0
1.0
Durchgang [%]



Advantages

- Compact construction, light and portable
- Easy cleaning due to fast dismounting and small volume (32l)
- Extremely low amount of dust needed
- Controllable and reproducible dust supply
- Almost laminar airflow in the measuring zone
- Velocity and direction of inflow in the detector can be adjusted
- Airflow adjustable

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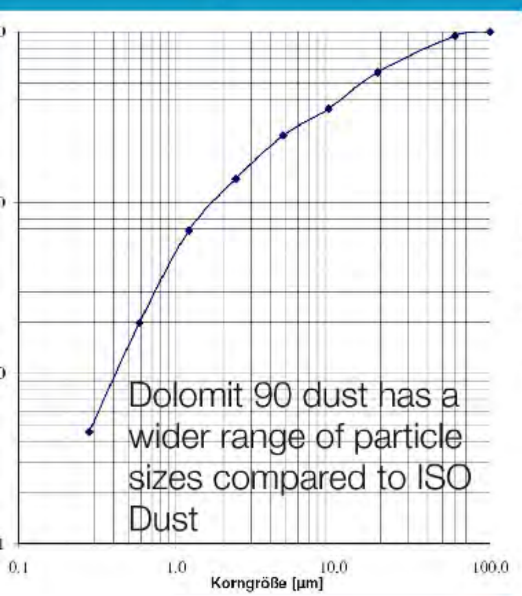
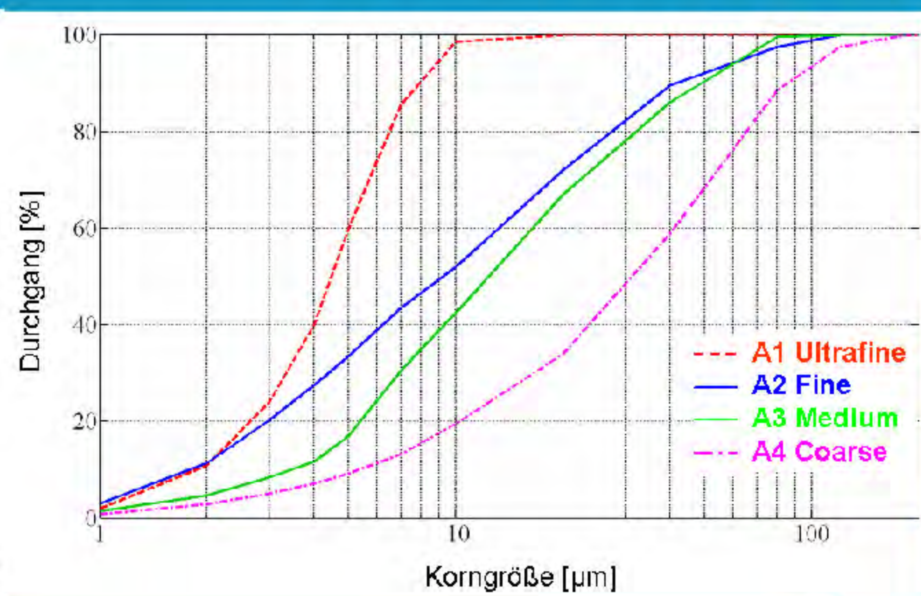


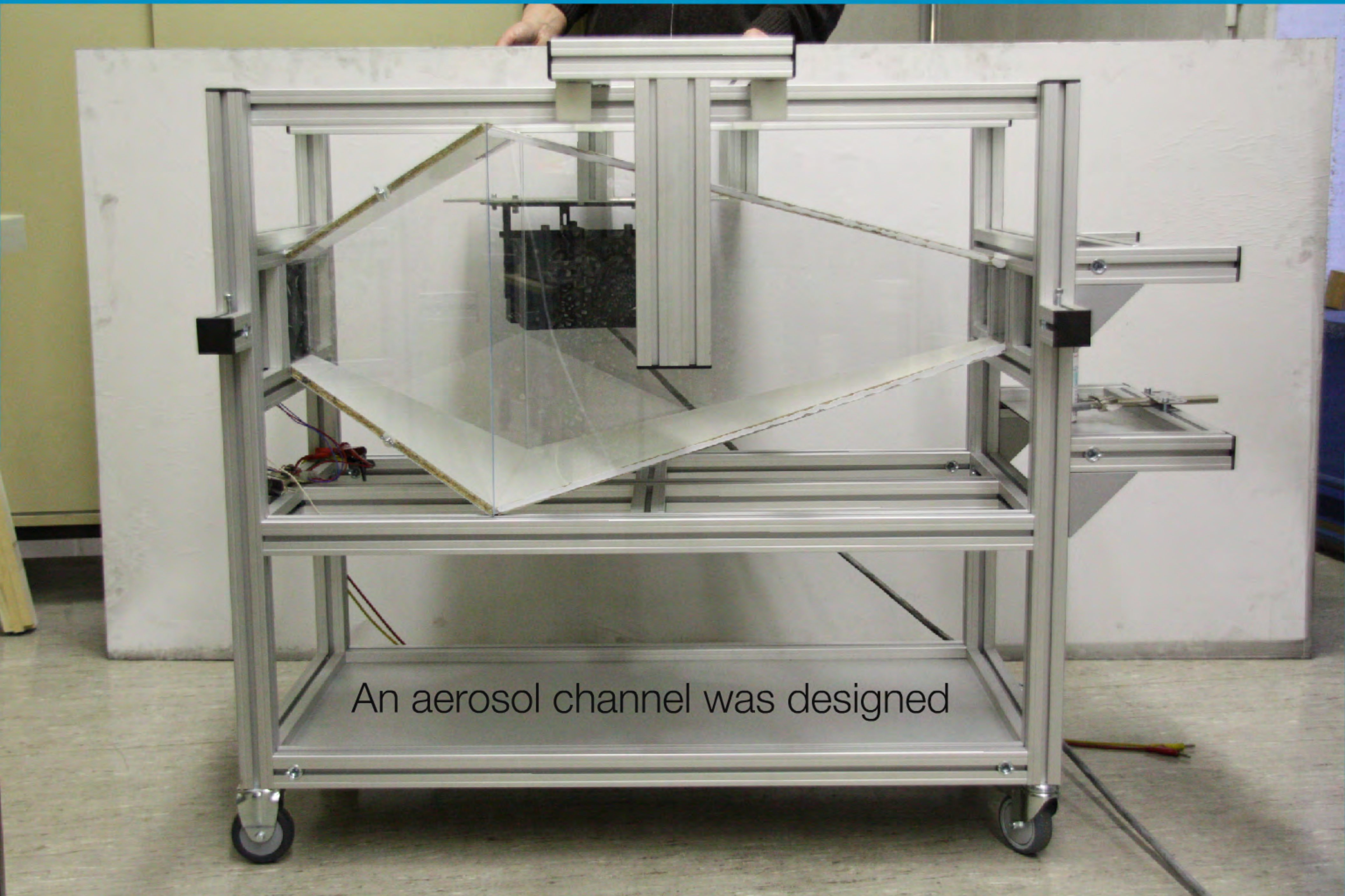


AEROSOL TESTING

- Dust chamber cannot be used for aerosol testing due to spray volatility
- It is challenging to define a standardized test procedure due to highly different smoke detector behaviour

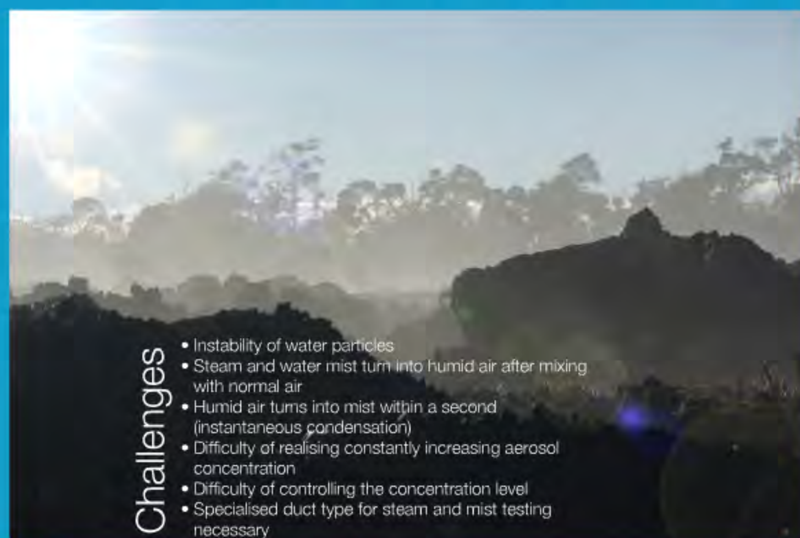
Deodorant
Insecticide


Spray properties of many different aerosol cans were analysed and characterized
31°


An aerosol channel was designed

A computer controlled servo actuates the spray can

FOG TESTING


Challenges
• Instability of water particles
• Steam and water mist turn into humid air after mixing with normal air
• Humid air turns into mist within a second (instantaneous condensation)
• Difficulty of realising constantly increasing aerosol concentration
• Difficulty of controlling the concentration level
• Specialised duct type for steam and mist testing necessary

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Consolidated

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Test Procedure TBC

Ongoing 2year project

Conclusion/Outlook