International Aircraft Systems Fire Protection Working Group Meeting
23 May 2012 – Cologne

Cargo Smoke Detector False Alarm Rejection Standard

every is only as good as its test methods.

Cargo Compartment Smoke Detector AS 8036 Standard Revision

Presented by
Dr. André Freiling

AIRBUS

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SAE The Engineering Resource For Advancing Mobility®

400 COMMONWEALTH DRIVE, WARRENDALE, PA 15096

AEROSPACE STANDARD

AS 8036

Issued 4-1-85
Revised

CARGO COMPARTMENT FIRE DETECTION INSTRUMENTS

1. PURPOSE: This standard establishes minimum requirements for cargo compartment fire detection instruments primarily for use in reciprocating and turbine engine powered aircraft.

2. SCOPE:

2.1 This standard covers the following types of fire detection instruments intended for use in protecting aircraft cargo compartments, galleys, electronic equipment bays and other similar installations.

2.2 Types:

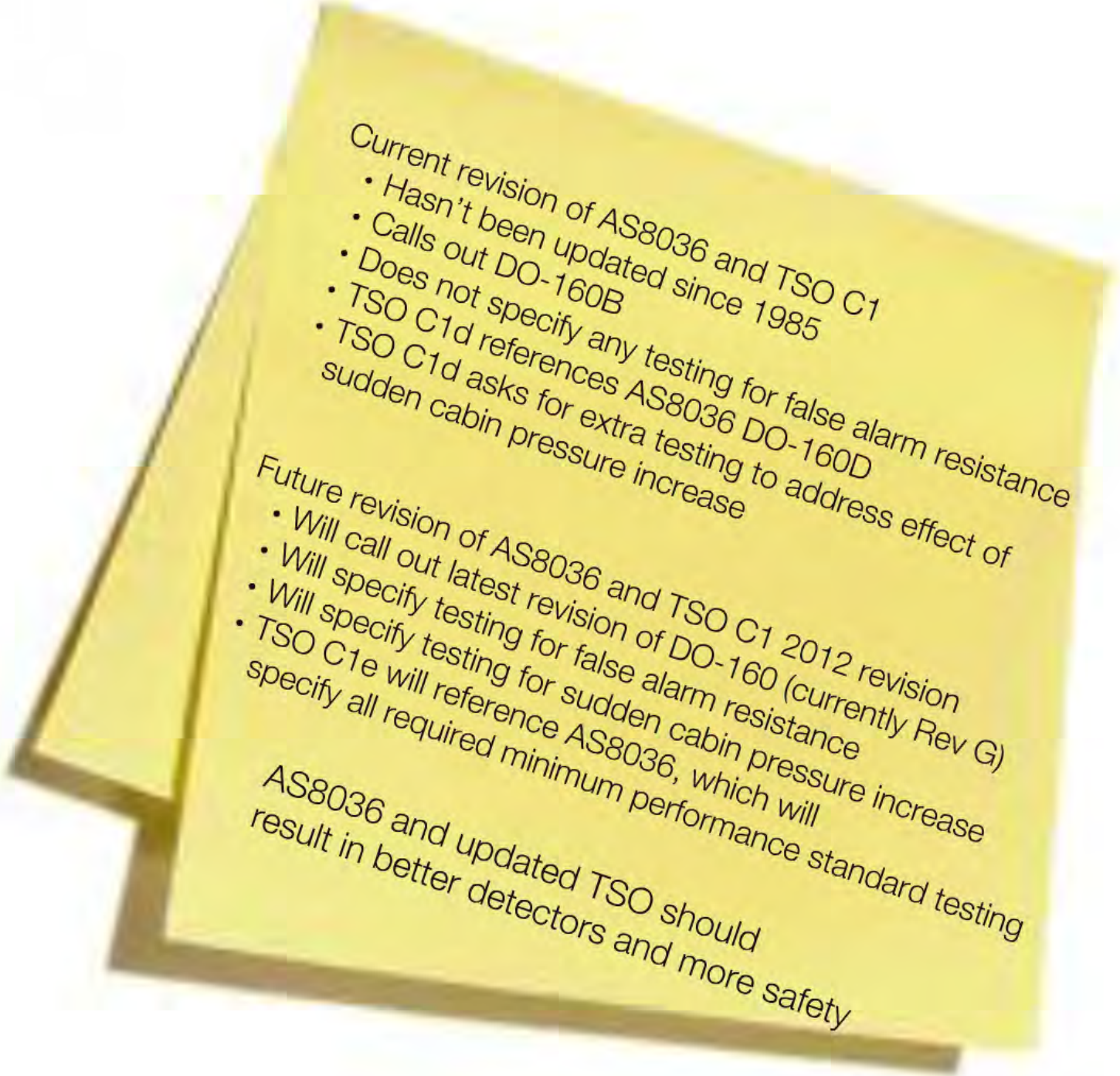
Type I: Carbon monoxide, an instrument which will actuate an alarm signal when the concentration of carbon monoxide in air exceeds a specified value.

Type II: Smoke detector, electronic, an instrument operating on the principle of smoke particles modifying the relationship between a light beam and electronic light sensor which will actuate an alarm signal when the concentration of smoke in air exceeds a specified value.

Type III: Smoke detector, visual, an instrument which, by visual means, will show in a positive manner the presence of smoke when the concentration of smoke in air exceeds a specified value.

Type IV: Smoke detector, electronic, an instrument operating on the principle of smoke particles modifying the current in an ionization chamber which will actuate an alarm signal when the concentrations of smoke in air exceeds a specified value.

Type V: Same as Type IV except maximum operating altitude is 18,000 ft. (5,486 M) when installed in a non-pressurized area.

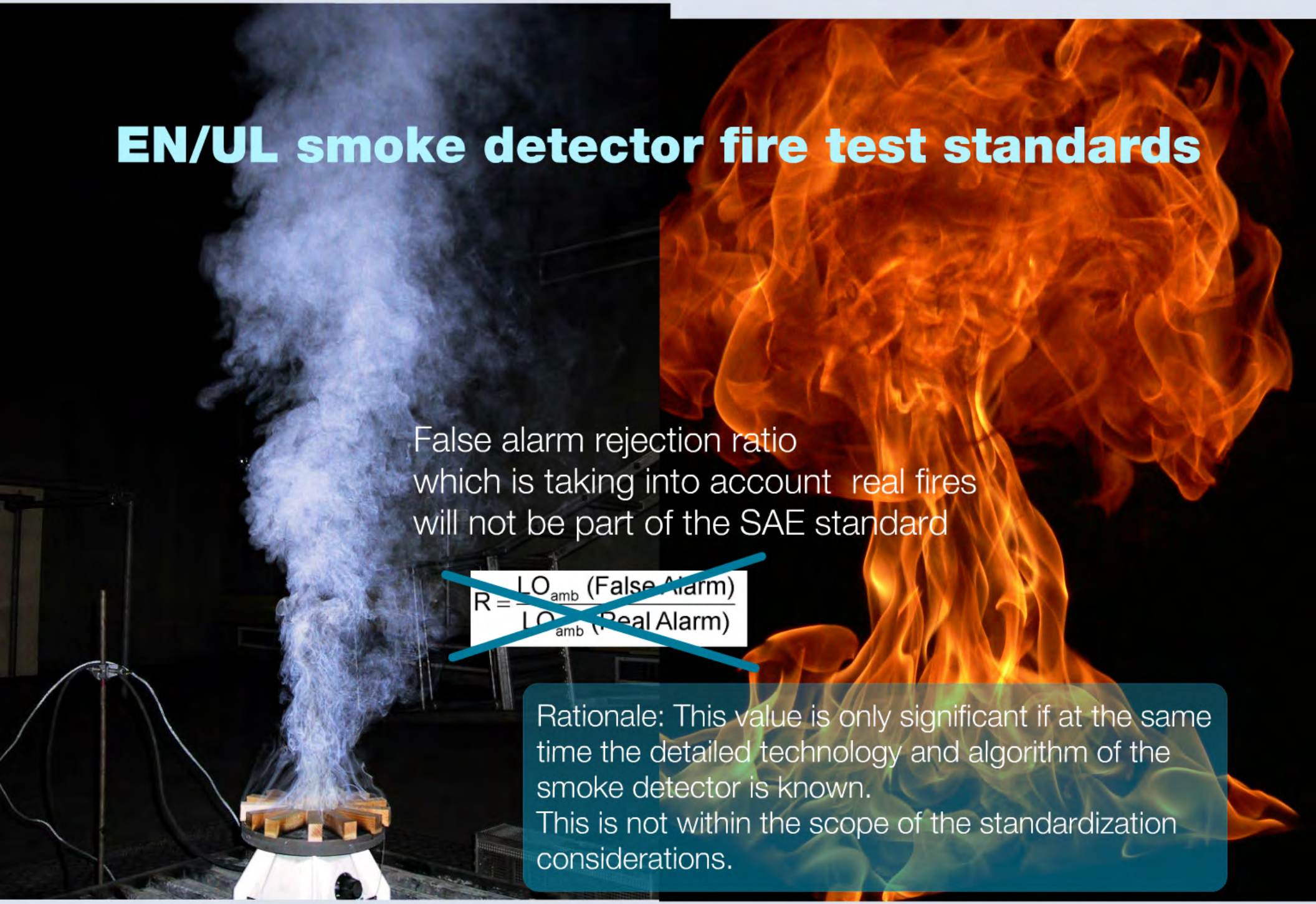

Current revision of AS8036 and TSO C1
• Hasn't been updated since 1985
• Calls out DO-160B
• Does not specify any testing for false alarm resistance
• TSO C1d references AS8036 DO-160D
• TSO C1d asks for extra testing to address effect of sudden cabin pressure increase
Future revision of AS8036 and TSO C1 2012 revision
• Will call out latest revision of DO-160 (currently Rev G)
• Will specify testing for false alarm resistance
• Will specify testing for sudden cabin pressure increase
• TSO C1e will reference AS8036, which will specify all required minimum performance standard testing
AS8036 and updated TSO should result in better detectors and more safety

David Alexander, SAE
Keely Andrews, SAE
Ken Bell, Kidde
Dave Blake, FAA Tech Center
Ian Campbell, Meggitt
Laura Feix, SAE
Andre Freiling, Airbus
Stephen Happenny, FAA
Joan Hughson, FAA
Larry Lamberth, Honeywell
Bruce Mahone, SAE
Bruce Miller, Boeing
Gerd Wedler, apparatebau Gauting
Loic Frère, Siemens


AS8036 available
modify TSO C1
Send out AS8036 for public reading and comments
Test procedures
Pass fail criteria
2012
Way forward and schedule
May
July
Sept


Cargo Smoke Detector Challenges
FIRE
FOG
DUST
INSECTICIDE
LIGHT
Summary

EN/UL smoke detector fire test standards

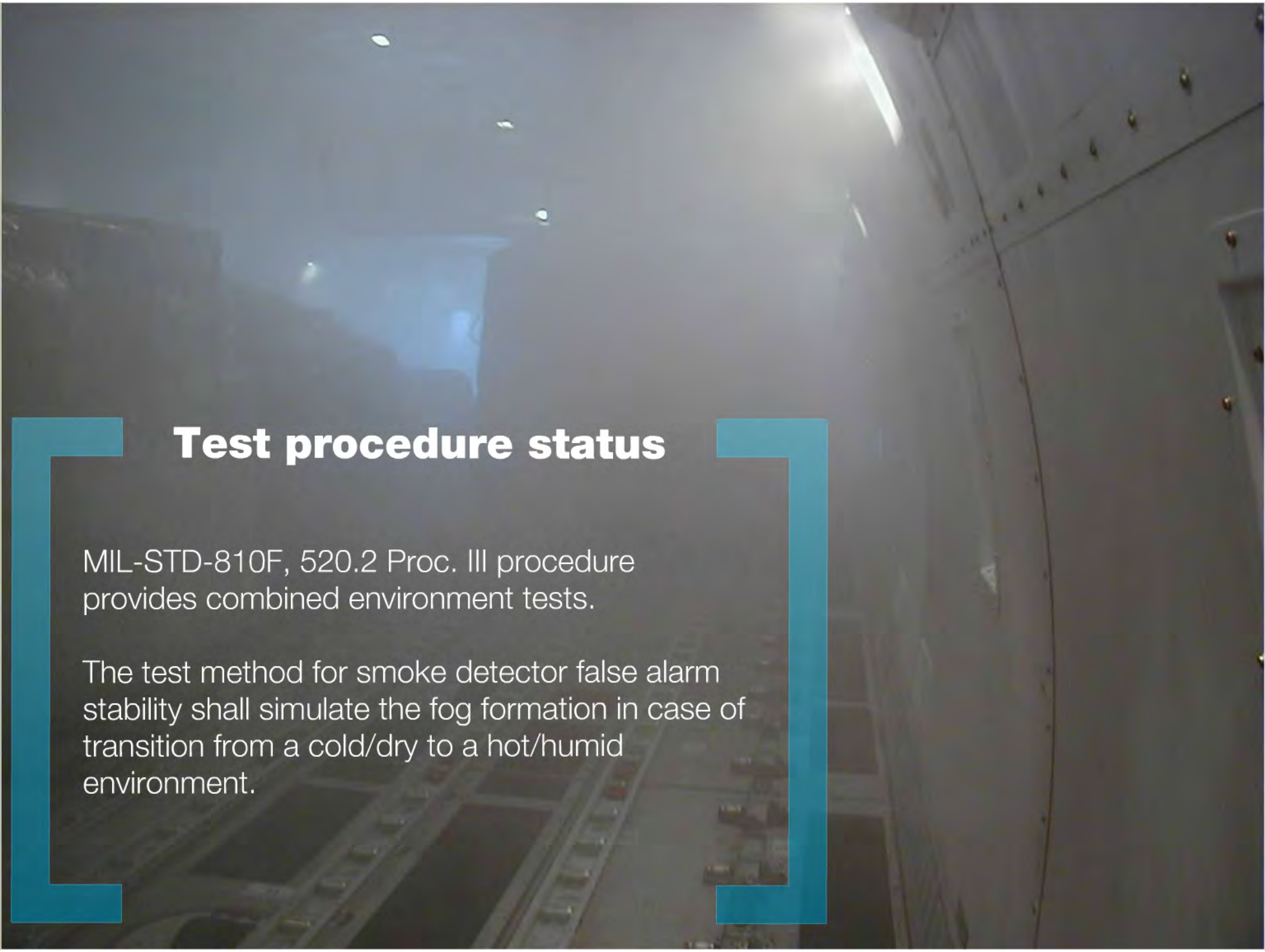


False alarm rejection ratio
which is taking into account real fires
will not be part of the SAE standard

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

Rationale: This value is only significant if at the same time the detailed technology and algorithm of the smoke detector is known.
This is not within the scope of the standardization considerations.


FOG



Test procedure status

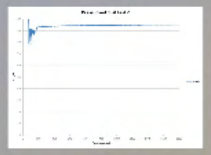
MIL-STD-810F, 520.2 Proc. III procedure provides combined environment tests.

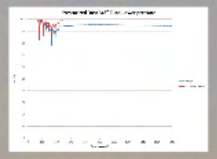
The test method for smoke detector false alarm stability shall simulate the fog formation in case of transition from a cold/dry to a hot/humid environment.

DUST

Results

Arizona road dust, fine





Based on the test results obtained at FAA Tech Center, the light obscuration to be used for dust false alarm resistance standard shall be

10%LT/ft = 32,8%LT/m = 1,72db/m

Test setup prototype

Important:

- **reproducible slope**
- **controlled dust injection**
- **rotational air speed**
- **laminar flow**

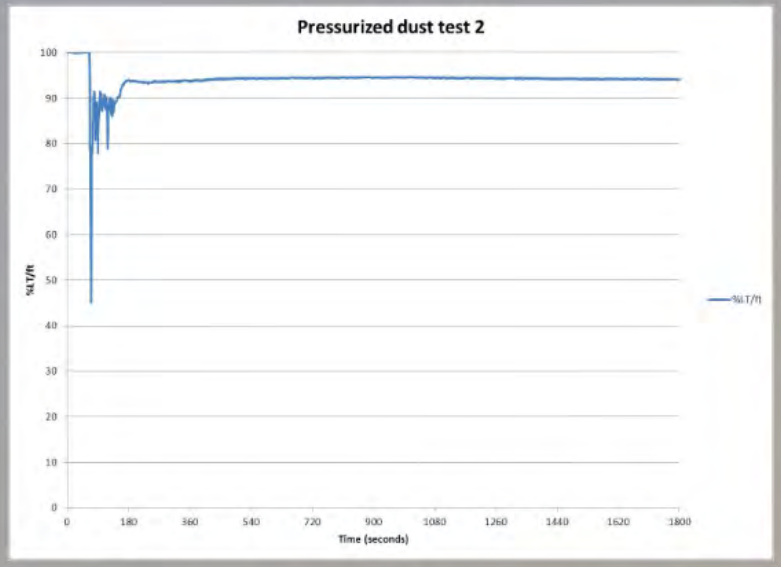

Tests performed at FAA Tec Center in order to
estimate realistic amount of dust for test chamber

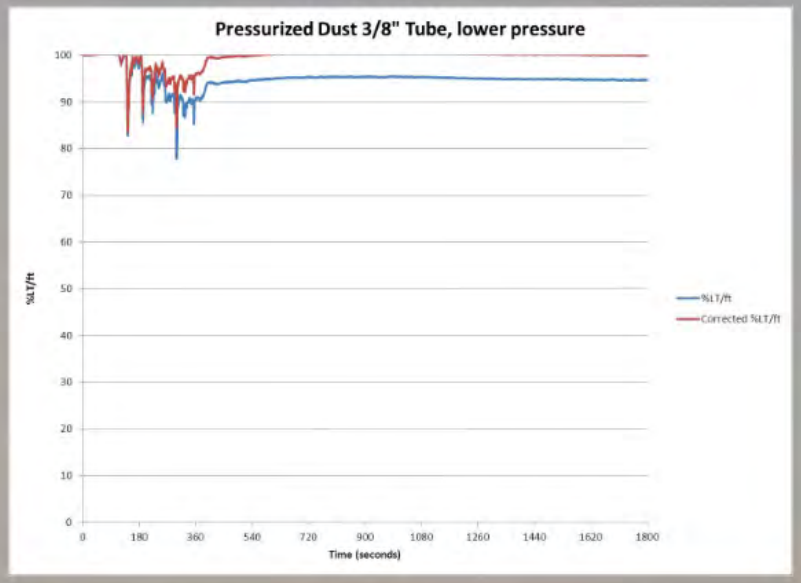

Internal dip tube
Compressed air


JB-7

Results

Arizona road dust, fine





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10%LT/ft = 32,8%LT/m = 1,72db/m

Test setup prototype

Important:

- reproducible slope
- controlled dust injection
- rotational air speed
- laminar flow


INSECTICIDE

The most challenging issue

Schedule of Aircraft Disinsection Procedures

Australian Government
Australian Quarantine and Inspection Service

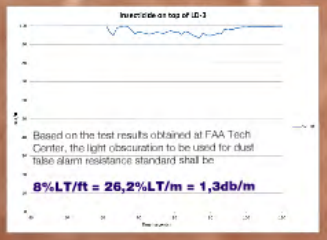
Australian Quarantine and Inspection Service

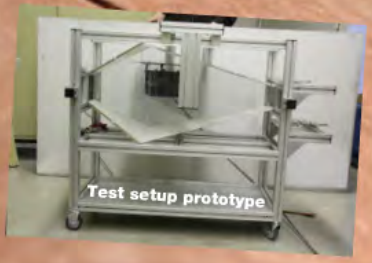
and

BIOSECURITY NEW ZEALAND

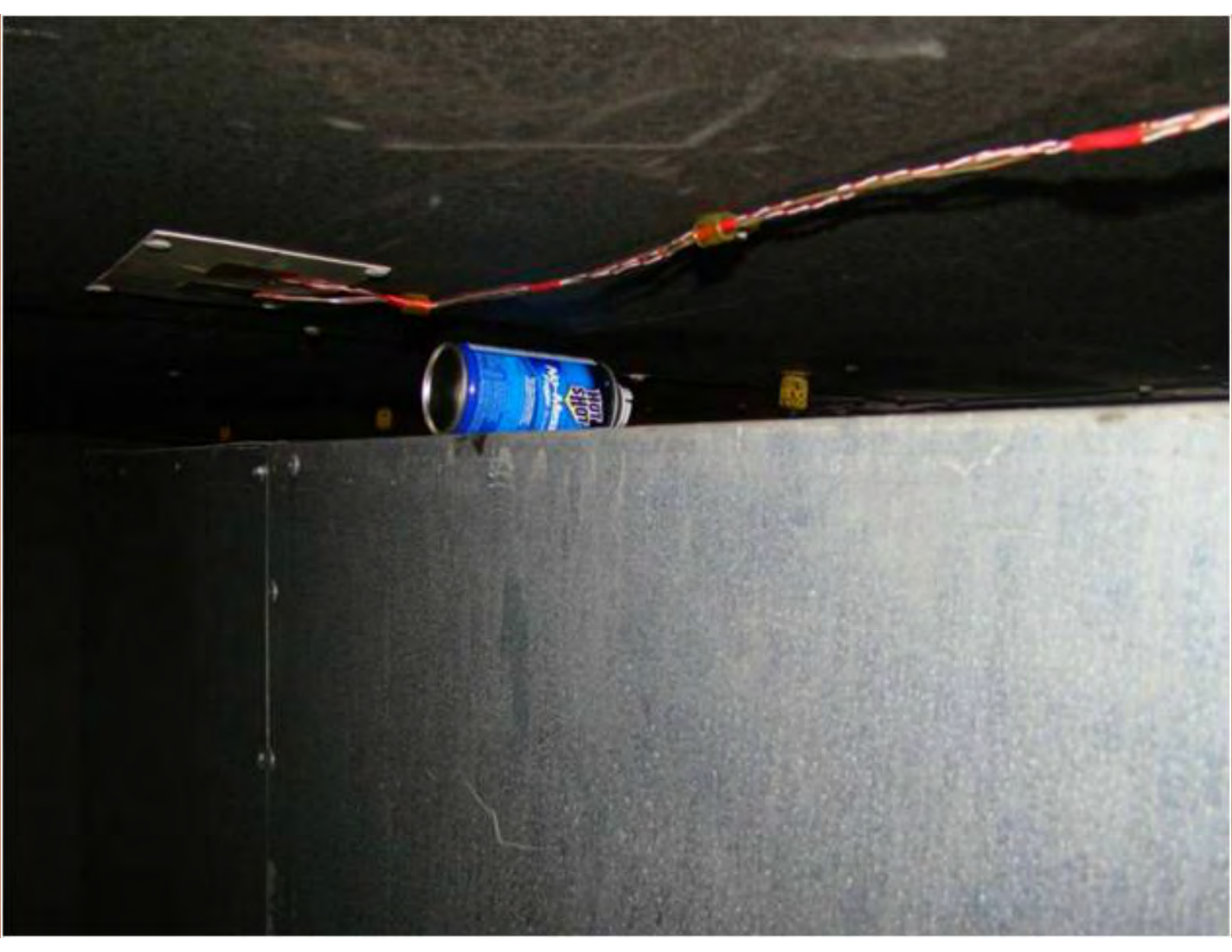
Ministry of Agriculture and Forestry
Biosecurity New Zealand

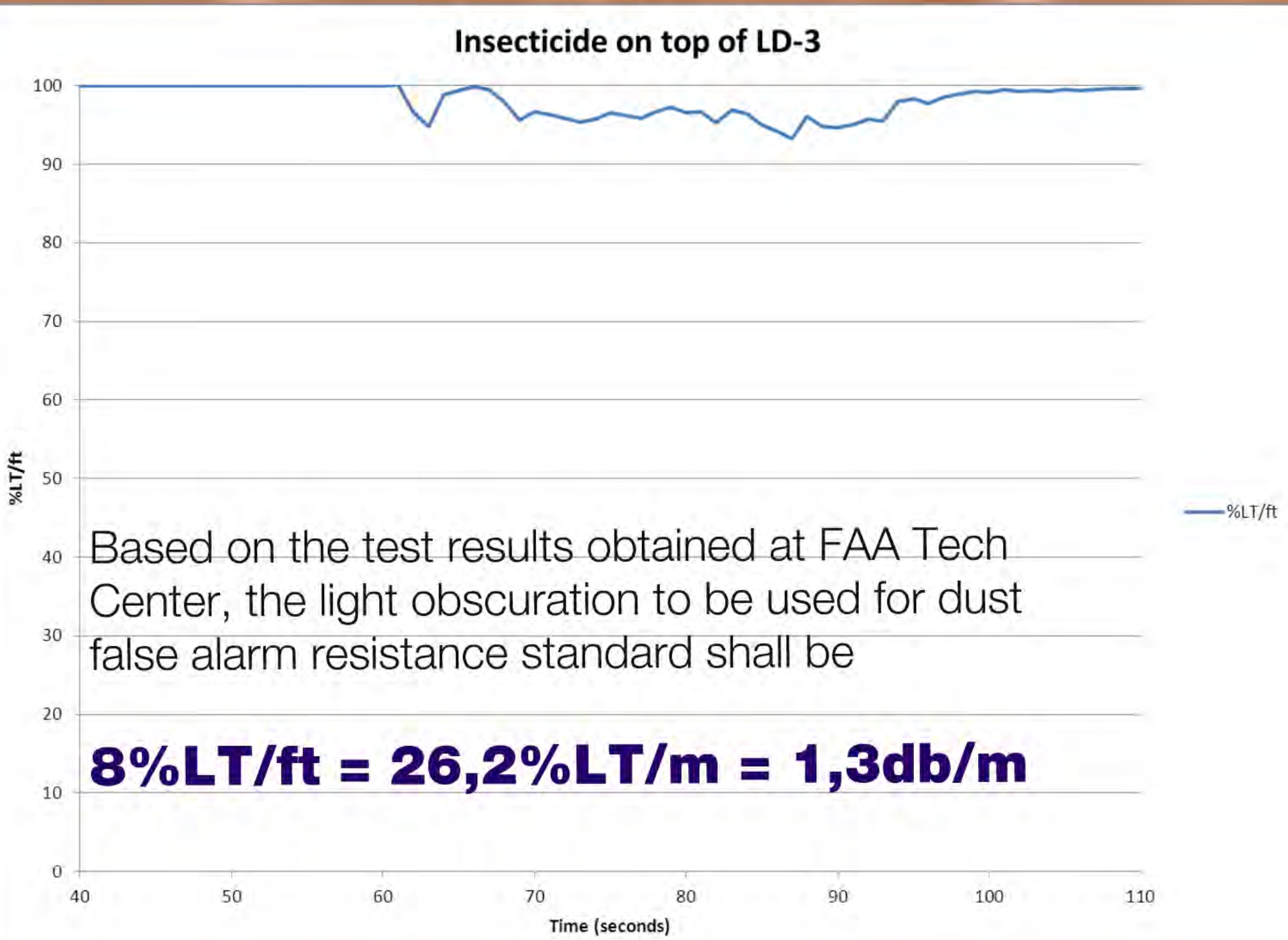
Version 2.1

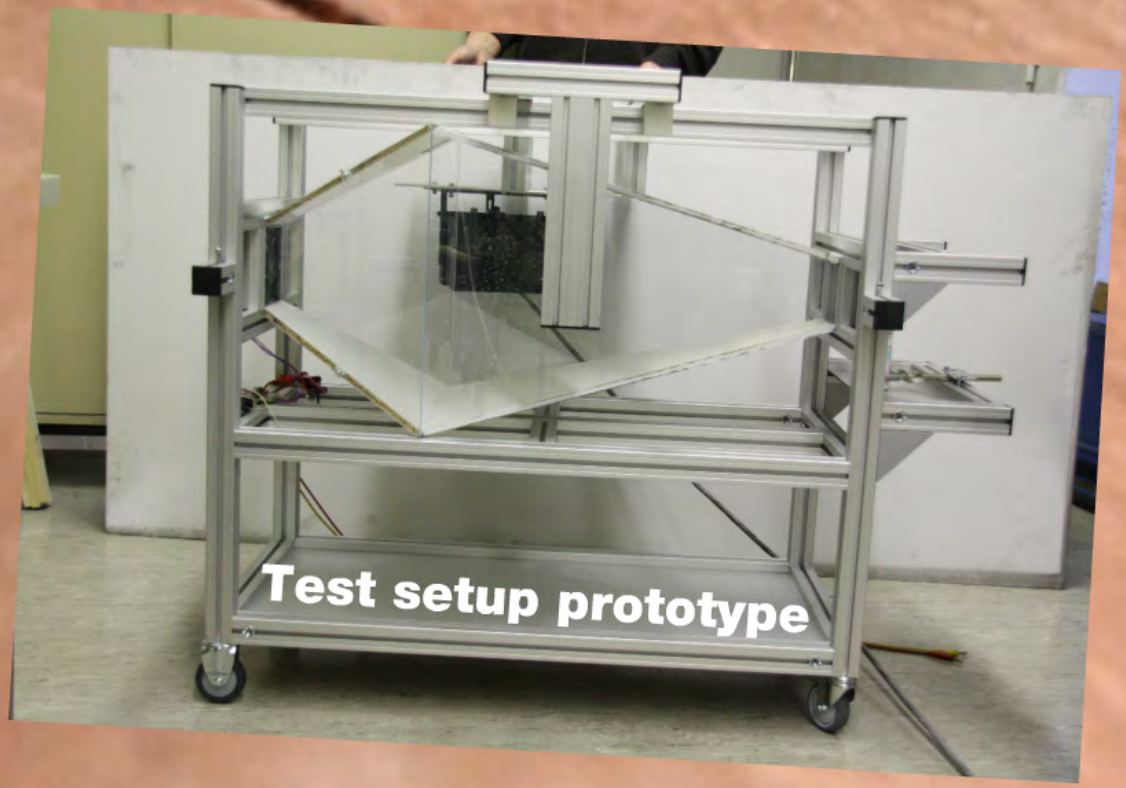




- Test setup currently under discussion
- Goal: minimum diversity of test apparatus
- possibly use dust channel

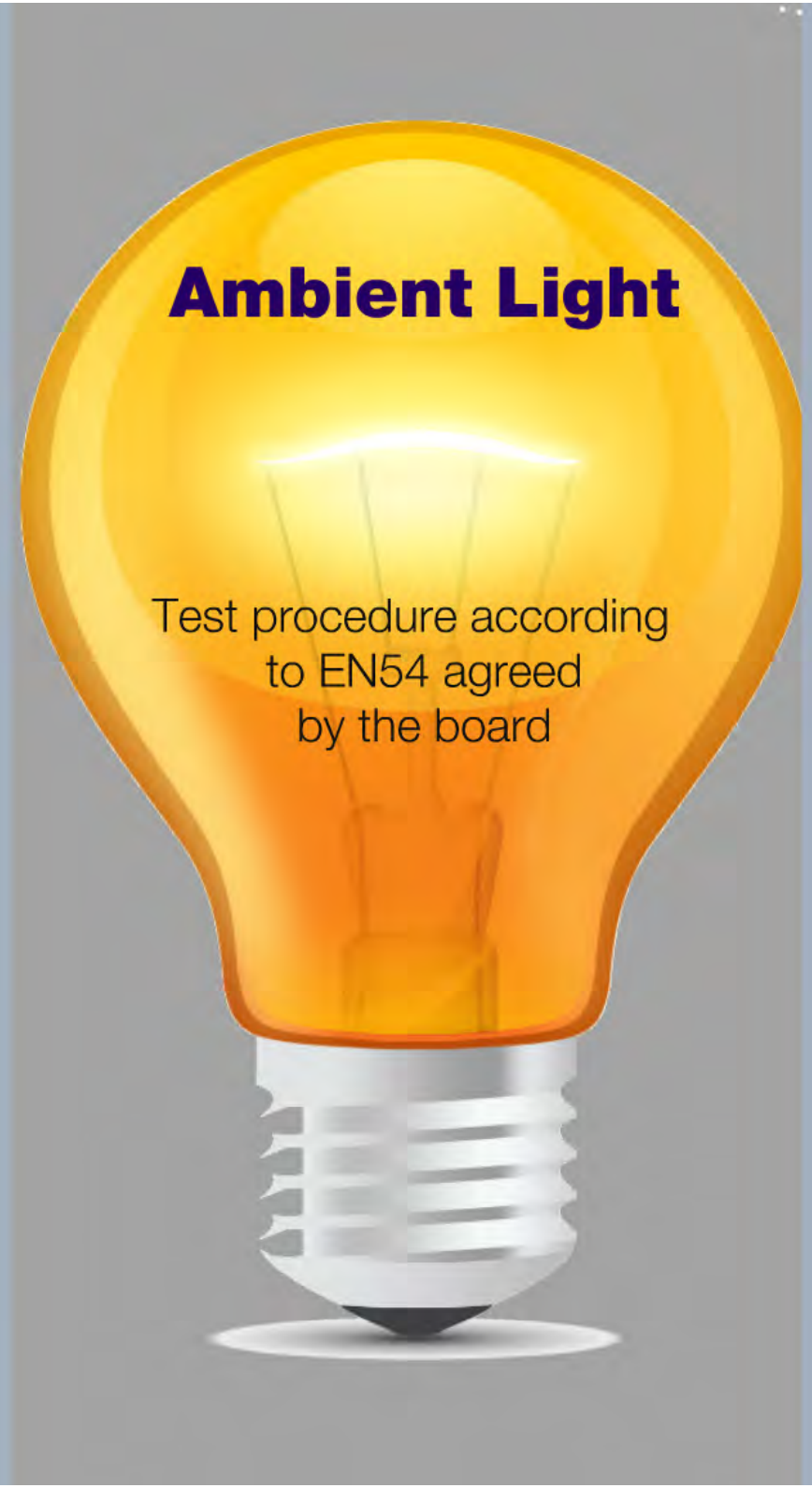



Insecticide on top of LD-3
100
90
80
70
60
50
40
30
20
10
0
%LT/ft
40
50
60
70
80
90
100
110
Time (seconds)
%LT/ft
Based on the test results obtained at FAA Tech Center, the light obscuration to be used for dust false alarm resistance standard shall be
8%LT/ft = 26,2%LT/m = 1,3db/m



- Test setup currently under discussion
- Goal: minimum diversity of test apparatus
- possibly use dust channel

LIGHT


Ambient Light
Test procedure according
to EN54 agreed
by the board

Summary

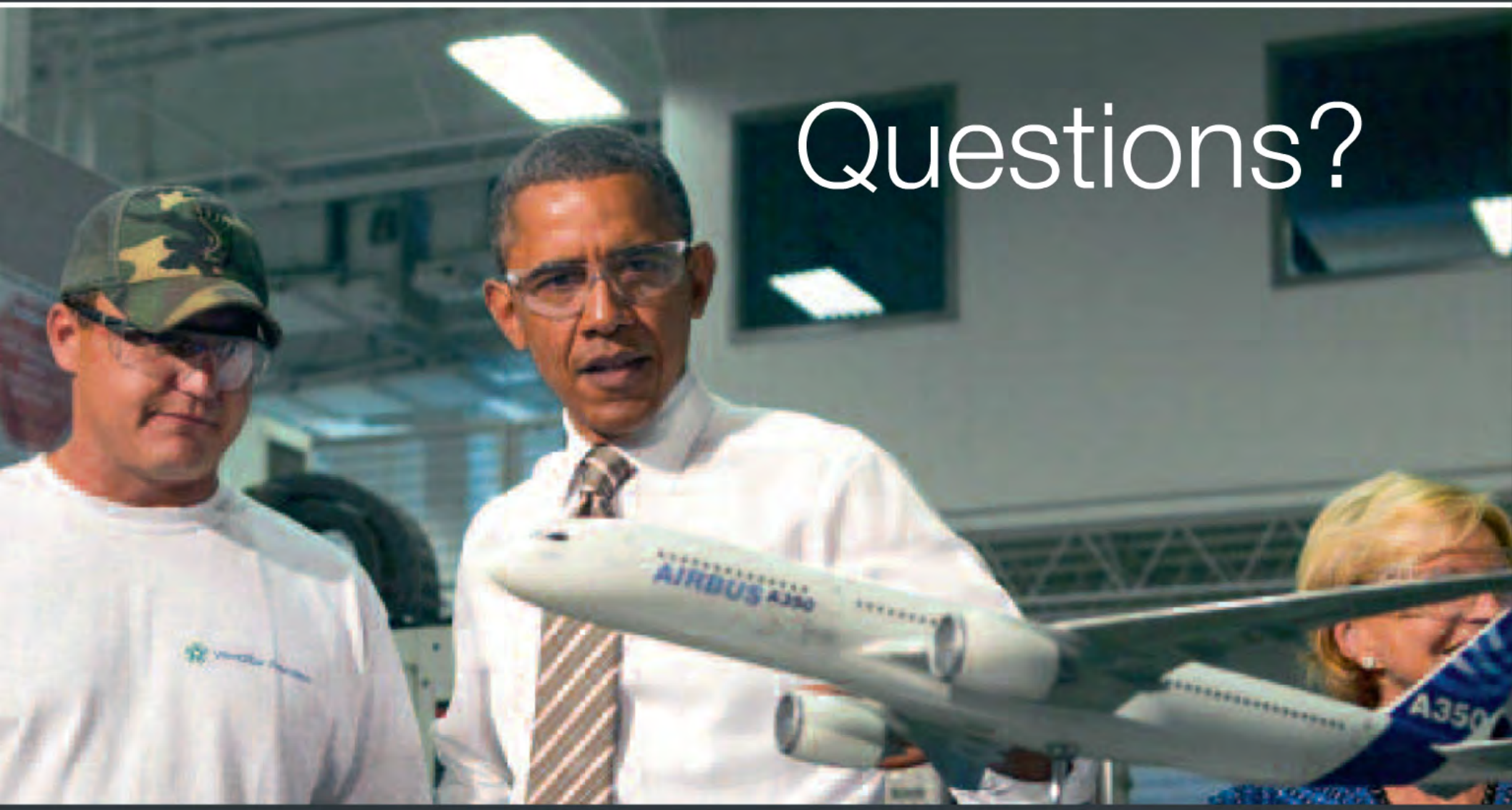
- AS8036 commitee is WebExing regulary (bi-weekly)

Achievements so far:

- FAA Tech Center Test campaign and resulting agreement on test levels for dust and insecticide
- Agreement on ambient light test procedure
- Specification of absolute values, no ratio

ToDo:

- Fog test procedure to be finalized
- Insecticide test procedure and setup to be discussed


Questions?
AIRBUS A350