

## **Aircraft Certification Testing for Smart Smoke Detectors**

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Lower deck cargo compartments of commercial aircraft have to be equipped with fire detection and suppression means. Both means are required to achieve certification for these compartments. By certification rules it is specified [CS/FAR25.858(a)] that “The detection system must provide a visual indication to the flight crew within one minute after the start of a fire”. In order to verify this one-minute smoke detection rule, flight tests are performed with smoke generators to be certified. The detailed test programme is agreed in advance of the flight test campaign with the international airworthiness authorities. This includes the settings of the smoke generator to be used.

Modern smoke detection systems in aircraft have to be extremely false alarm resistant and reliable because the situation in the cargo compartment cannot be verified during flight and the consequences of a smoke alarm are for example in-flight turn backs and flight diversions. Especially in the case of a false alarms, this causes unnecessary passenger inconvenience.

Sources for false alarms are dust, water mist / fog and aerosol sprays such as insecticides. To address the false alarm resistance of modern smoke detectors, the SAE (Society of Automotive Engineers) standard AS8036 has been established. On the other hand, the standard for selecting a smoke source for aircraft certification dates back to 1994 and allows for smoke sources which are not suitable for smart modern smoke detectors because they might represent a false alarm source.

In the context of applying SAE AS8036 it was identified that it is mandatory to update and at the same time internationally harmonise smoke sources for aircraft certification testing. For this purpose, the American FAA (Federal Aviation Administration) called for a task group to investigate on opportunities for a standardised calibration procedure. The ongoing work of this group is to focus on the relevant parameters like buoyancy, dynamics, light obscuration and particle size.

Recent test results show that emitted smoke from different smoke generator models might behave differently depending on the environment in which the generator is operated. Additionally, tests with different smoke detectors show that the detection time towards a specific smoke generator varies.