



A breath of fresh air

If cabin air quality is compromised, it can have serious repercussions for operators and their passengers. Teledyne Controls reveals how ACES has evolved to monitor and address potential air quality issues and ensure a better, safer flying experience.

Although cabin air quality on commercial aircraft is normally very good, smoke, odour and fume events do happen. When they do, the cost for the operator can be high, including medical expenses, potential legal fees, cancelled flights, maintenance time, insurance premiums and brand damage.

Interestingly though, there is no automatic equipment installed on board most aircraft today to accurately monitor and measure the air quality in both the cabin and the flight deck. When an air quality incident occurs, understanding what really happened is largely based on human perceptions. For example, the incidents reported are classified by odour type, such as oil smell, electric smell, burned smell, etc. which leaves room for subjectivity and often results in the inability for the operator to identify the root cause for the event. Moreover, events that did not exceed an established health standard to be considered harmful, but had strong smell or smoke associated with them, may be reported, whereas events involving hazardous, but invisible or odorless contaminants, such as carbon monoxide or ozone, may occur and remain undetected.

MONITORING CABIN AIR QUALITY

Teledyne ACES™ (Aircraft Cabin Environment Sensor) is the first FAA-certified solution to address this problem. The project started after hearing from multiple airlines about challenges related to cabin air quality and the lack of means to comprehensively monitor it. The solution, which was specifically designed for the aviation market, leverages extensive air quality expertise within Teledyne Technologies Incorporated, combined with Teledyne Controls' core expertise in data acquisition, wireless transfer, and analysis. ACES evolved quickly from concept to certification in just over two years and is now FAA certified on the 737 with A320 certification expected by the end of Q2 2021. The system has been installed on a major US Airline and is performing extremely well in a variety of on-aircraft and off-aircraft tests.

The ACES Mobile App provides instant access to air quality data during flight.



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By providing continuous monitoring and accurate measurements of the air quality in the cabin and flight deck, ACES enables aircraft operators to verify the health of their cabin environment and determine if and when an air quality event occurs, its scope and severity, and the level of exposure to passengers and crew.

The ACES ecosystem includes onboard devices that are installed in the cabin and flight deck, and continuously sense and monitor potentially harmful contaminants. Those devices employ laboratory-grade sensors that record key environmental parameters, including data on airborne



The ACES Onboard Devices continuously sense and monitor the air quality in the cabin and flight deck as soon as the aircraft is powered.

particulates from 0.3 to 10 microns in size, carbon dioxide, carbon monoxide, ozone, volatile organic compounds and several other parameters. For example, many aircraft have ozone converters, and ozone has been known to be a source of concern. By measuring ozone levels, operators can monitor the performance of those systems. Another example is to verify cabin cleanliness. The recording of particulate and volatile organic compound data can help ensure the effectiveness of the aircraft's HEPA (high-efficiency particulate air) filters.

The data recorded by the ACES onboard units is automatically transmitted to an ACES cloud service portal for immediate processing and analysis. The transfer happens seamlessly upon landing, via the onboard units' built-in wireless cellular module, or continuously during flight with an available Wireless Access Point and broadband air-to-ground connectivity. Air quality data can also be accessed during flight on a mobile device.

EFFICIENT DATA ANALYSIS

Through the ACES cloud service portal, aircraft operators have secure web access to a series of comprehensive dashboards, custom alerts, and reports, so they can validate the air quality in the cabin and immediately identify unusual particulate levels. If an air quality event occurs, instead of making assumptions based on human perceptions, they have objective data at their disposal to troubleshoot and diagnose the issue. For example, by being able to differentiate between unhealthy levels of engine oil, versus exhaust or de-ice fluid, maintenance teams can narrow down their troubleshooting efforts to specific areas and more quickly and efficiently isolate and remedy an issue. Post-maintenance air quality measurements will then help verify if an issue was fully resolved. By monitoring trends on specific aircraft, operators can also identify and address potential emerging issues to help prevent future incidents, which results in more efficient operation and a better flying experience for passengers and crew.