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POSITION PAPER

CEN TC 436: Cabin Air Quality on Civil Aircraft- Chemical Agents

The GCAQE raised its concerns with the European Commission and CEN about the airline industry and standardization process related to prEN 4666 and EN 4618 in early 2012 and numerous other times since then. The standards and draft standards were withdrawn, as we know in late 2013 via the public enquiry process.

The GCAQE will not support the development of a chemical marker list that could be used to:

- Determine suitability/adequacy of the air at certification or during continuing airworthiness;
- Allow end users to identify the suitability/adequacy of the quality of the air supplied in aircraft.
- The TC 436 scope accepted by TC decision 2016/02. The scope and this standard are unable to determine where adverse effects could occur in the aircraft environment and therefore the "Best Available Technology" (BAT) must be used to prevent exposures.
- TG1 goal and approach as accepted by TC decision 2017/04. This is because:

    - current technology cannot reliably identify realistic exposures to the relevant fluids. Higher dose exposures may be detected, while lower-levels will not;
    - intervention levels must use BAT to identify exposures at the lowest levels possible;
    - a practical approach as outlined below could be utilised to identify where interventions should be implemented, protecting people from exposure as much as possible;
    - the implementation of a trigger level that is set at a level high enough where it does not go off too frequently, so as to not be ignored by the crew is unacceptable;
    - trigger levels that may be ignored in operation are unacceptable;
    - any reference to health/toxicity limits, occupational or public health or similar is unsuitable.

- The TG 1 goal and approach ought to read as follows:

The goal: *The primary goal of TG1 is to identify practical markers that could be related to potential sources of airborne contaminants onboard (e.g. oil, deicing fluid, exhaust, hydraulic fluid, etc.) and for which measurement technology could exist that can reliably detect relevant* *concentrations. The purpose of developing such practical markers is to identify candidates that could be measured using 'Best Available Technology' (BAT) (e.g., continuous, periodically, during a fume event, trouble-shooting post-event, etc.). Due regard will be given to low level measurements and mixture technology either through manufacture or by chemical reaction.*

The approach: *This list will be the basis for a practical approach to identify the presence of selected airborne contaminant markers that may require intervention ("intervention level"); e.g., maintenance post-flight, source isolation inflight. The intervention level should be as low as can be achieved using the best available technology (BAT). This should be helpful in rapidly responding to a higher dose acute event, however it will not address repeated low dose exposures in normal flight. This approach is not intended to define the toxicity, acceptability or health outcomes of chemical compounds in the cabin environment. It is simply a practical method to determine when interventions may be required.*

The GCAQE will not support a standard that fails to recognize the currently existing regulations/directives, standards and acceptable compliance (AMC) material related to at least:

- CS 25.1309C – Warning information for unsafe system operating conditions
- Impairment due to contaminated bleed air: CS E 510/CS APU 210 & AMC safety analysis occurring on a greater than remote basis
- Adverse effects related to CS 25.831 a/b
- Unsafe condition: AMC 21.A.3B (b)
- Principles of prevention: Article 6, Council Directive: 9/391/EEC [1]

The GCAQE is concerned that classical toxicology and individual substance identification, as supported by a majority of CEN TC 436 members, will not address the following issues:

- Exposure to oil vapours and aerosols are reportedly associated with ultrafine particles (UFP) at the 10-150nm range or less;[2]
- Background exposures of oil contaminants and fluids occur in normal operations;[2,3,4,5,6,7]
- Most current sensor technology will not detect the low levels of contaminants associated with the oils and fluids in routine operating conditions. They may be suitable to capture the rare major failure scenario only, but not the low-level background exposure associated with normal operations;

1. EEC (1989) Council Directive of 12 June 1989 on the introduction of measures to encourage improvements in the safety and health of workers at work: http://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:01989L0391-20081211&from=EN
2. Jones B, Roth J, Hosni M et al. The Nature of Particulates in Aircraft Bleed Air Resulting from Oil Contamination. LV-17-C046. In: 2017 ASHRAE Winter Conference—Papers. Kansas State University, 2017.
3. Michaelis S (2016) Implementation of the requirements for the provision of clean air in crew and passenger compartments using the aircraft bleed air system. Cranfield University, England.
4. Spengler J, Vallarino J, Mcneely E et al. RITE-ACER-CoE-2012-6. In-Flight / Onboard Monitoring : ACERs's Component for ASHRAE, 1262, Part 2. Boston: RITE/ACER, 2012.
5. de Boer J, Antelo A, van der Veen I et al. Tricresyl phosphate And The Aerotoxic Syndrome Of Flight Crew Members - Current Gaps In knowledge. Chemosphere 2015;
6. EASA. Research Project : CAQ Preliminary cabin air quality measurement campaign. . Final report EASA_REP_RESEA_2014_4. Cologne: European Aviation Safety Agency, 2017.
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- Significant concerns have been raised about chronic low-level repeat exposure to organophosphates and complex mixtures.[8,9,10,11,12,13] The increased toxicity of exposure to nanoparticles has also been reported;[14]
- Adverse effects and carcinogenic potential related to low-level exposure to chemical mixtures are reported.[15,16] Single substance chemical markers will not address effects of complex mixtures, chronic low-level exposures;
- Exposure effects based on the most sensitive end-points;
- Exposure limits do not apply to the cabin air environment, nor should other public health limits.[17,18]

The GCAQE will support: the development of an air quality standard that will:

- Use practical measures to determine when operational or maintenance actions should be undertaken to prevent exposures to aircraft contaminated air related to oil, hydraulic and de-icing fluids;
- BAT should be used to identify and prevent such exposures. These may include: early warning markers to identify a rise in UFPs, carbon differential, oil or hydraulic and other fluid identifiers and other practical technologies. Technologies to reduce exposures such as effective total air filtration, air cleaning technologies, better designs and engineering/maintenance procedures and future aircraft to be designed bleed free should be implemented;
- Operational experience may necessitate intervention action without a trigger alert;
- Education and training for suspected fume exposures;
- The development of a standard as outlined above utilising independent, suitably qualified expertise relevant to the cabin air environment with a genuine balance. Such a committee must be adequately funded at a EU level.

In summary, the GCAQE will not support the development of a standard for cabin air quality that has similarities with 2 previously withdrawn standards, PrEN 4666 & EN 4618. Nor will we support standards development that does not adequately recognise existing regulations /directives, standards and associated material, or existing scientific literature. We do not believe this serves the safety, health or welfare of the end users of aircraft, airline crew, workers or passengers.

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