



**GUIDELINE**

**ASHRAE Guideline 28-2016**

(Supersedes ASHRAE Guideline 28-2012)

Includes ASHRAE addenda listed in Appendix C

# **Air Quality within Commercial Aircraft**

See Appendix C for dates of approval by the ASHRAE Standards Committee and the ASHRAE Board of Directors.

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**NOTE**

**Approved addenda, errata, or interpretations for this guideline can be downloaded free of charge from the ASHRAE website at [www.ashrae.org/technology](http://www.ashrae.org/technology).**

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(This foreword is not part of this guideline. It is merely informative and does not contain requirements necessary for conformance to the guideline.)

## FOREWORD

This guideline is intended to serve as a companion to ANSI/ASHRAE Standard 161-2007, Air Quality within Commercial Aircraft. Standard 161 provides an air quality standard that addresses the unique characteristics of the aircraft cabin environment and aircraft operations. In the process of developing this standard, the project committee gathered and organized a considerable amount of research and other supporting information related to assuring good air quality within the aircraft cabin. In order to keep the standard document reasonably concise, much of this information was not included in Standard 161. Guideline 28, which carries the same title as the standard, utilizes this information to provide additional guidance that can be used for assessing and assuring cabin air quality.

## 1. PURPOSE

This guideline serves as a companion to ASHRAE Standard 161 (ASHRAE 2007) and provides supplemental information on air quality in air-carrier aircraft and on measurement and testing related to aircraft air quality.

## 2. SCOPE

**2.1** This guideline applies to commercial passenger air-carrier aircraft carrying 20 or more passengers and certified under Title 14 CFR Part 25 (FAA 2008b).

**2.2** This guideline considers chemical, physical, and biological contaminants as well as, but not limited to, factors such as moisture, temperature, and pressure that may affect air quality.

## 3. DEFINITIONS

**air, ambient:** the outside air surrounding the aircraft.

**air, engine bleed:** air extracted from the compressor stages of gas turbine propulsion engines and auxiliary power units.

**air, outside:** the fraction of supply air that has not been recirculated in the cabin. As used in this guideline, the term usually refers to ambient air that is compressed in either the aircraft engines or APU, conditioned in the ECS, and supplied to the aircraft cabin. During ground operations, this term can also refer to ambient air that is conditioned by the ECS, ground cart, or airport conditioner, and delivered to the cabin.

**air, recirculated:** air from the aircraft passenger cabin that is reused as part of the supply air.

**air, supply:** air delivered to the aircraft cabin and used for pressurization, ventilation, temperature control, and humidity control.

**air-conditioning system (packs):** a part of the environmental control system, typically pneumatically powered, that

provides cooling and heating for aircraft cabin temperature control.

**aircraft, commercial:** aircraft engaged in common carriage per FAA 8300.10 (FAA 2006).

**alveolar partial pressure:** the partial pressure of oxygen at the interface between the lungs and the blood.

**auxiliary power unit (APU):** a gas-turbine powered unit that provides electrical power and compressed air to operate aircraft systems independent of the aircraft propulsion engines.

**blood oxygen saturation:** the level of oxygen dissolved in the blood as compared to the maximum level of oxygen capable of being carried by the blood.

**cabin:** a term applied to any spaces in the aircraft occupied by passengers or crew members.

**cabin altitude:** the effective altitude to which the aircraft cabin is pressurized.

**cabin pressure control system (CPCS):** part of the environmental control system that regulates cabin altitude.

**contaminant:** an airborne constituent that may reduce acceptability of the air.

**cockpit:** see *flight deck*.

**emergency cabin depressurization:** loss of cabin pressure in an environment where supplemental oxygen is required to sustain human life.

**environmental control system (ECS):** the equipment in an aircraft used to pressurize, ventilate, air condition, dehumidify, or humidify the aircraft cabin. It includes cabin-supply airflow control, pressure control, temperature control, distribution, recirculation, and air cleaning.

**flight:** a term used in this guideline to describe the status of the aircraft anytime it is not in contact with the ground. (This definition is not necessarily consistent with the FAA definition of "flight operations.")

**flight deck:** the portion of the aircraft occupied by the pilots for the purpose of aircraft operation (also referred to as the *cockpit*).

**flight management computer:** aircraft system that controls navigation. It may also include fuel management and flight planning functions.

**ground operations:** a term used in this guideline to describe the status of the aircraft anytime it is in contact with the ground and is occupied by at least one crew member.

**high-altitude operations:** aircraft flight in an outside environment incapable of sustaining human life.

**high-performance liquid chromatography (HPLC):** a test for determining the different contaminants in a chemical sample and their respective ratios in the sample; in this method, a sample is dissolved in a solvent and analyzed using a chromatograph.