



STANDARD

**ANSI/ASHRAE Standard 161-2018**

(Supersedes ANSI/ASHRAE Standard 161-2013)

Includes ANSI/ASHRAE addenda listed in Appendix B

# Air Quality within Commercial Aircraft

See Appendix B for approval dates.

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**NOTE**

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

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## FOREWORD

The environment aboard commercial aircraft is different than that found in other spaces commonly occupied by people. Occupant density is typically high, and occupant activity levels range from almost completely sedentary (passengers) to very active (flight attendants). Aircraft passengers and crew make up a wide cross section of the general population, ranging from the very young to the very old, from the healthy to the infirm, and from frequent fliers to inexperienced fliers. In addition, the aircraft must be regarded as both a public place (passengers) and a workplace (crew). A unique aspect of the aircraft environment is that, unlike many other indoor environments, including those for some other modes of transportation, occupants cannot remove themselves from the environment. The controlled atmosphere aboard the aircraft in flight is at a lower pressure and relative humidity than that found in many other environments. Further, unlike other indoor environments, the outside air intended for ventilation is first compressed and heated in the aircraft engines/APU or electrically driven compressor, creating the potential for engine-sourced and entrained compounds to contaminate the cabin air.

This standard addresses these unique characteristics of aircraft cabin environments as well as characteristics that are common to many other indoor environments. The scope of this standard references Title 14 CFR 25 to define the category of aircraft to which the standard applies. It is not intended to exclude aircraft of the same category certified in other jurisdictions. The term “commercial aircraft,” as used in this standard, refers to aircraft engaged in common carriage as defined in the *Airworthiness Inspector’s Handbook, Order 8300.10, Volume 2, Chapter 60, Section 5*.

This 2018 edition of the standard includes a number of changes, all of which are detailed in Informative Appendix B. Notably, the document includes a new Section 10 with a standardized reporting form to assist maintenance workers in their troubleshooting process. The standard also now provides additional guidance related to maintenance protocols for checking and adding oil to APUs.

Standard 161 is updated using ASHRAE’s continuous maintenance procedures. Per these procedures, the standard is continuously revised by addenda that are publicly reviewed, approved by ASHRAE and ANSI, and published and posted for free on the ASHRAE website. Instructions and forms for submitting a proposed change can be found at the end of the standard.

## 1. PURPOSE

This standard defines the requirements for air quality in air-carrier aircraft and specifies methods for measurement and testing in order to establish compliance with the standard.

## 2. SCOPE

**2.1** This standard applies to commercial passenger air-carrier aircraft carrying 20 or more passengers and certified under Title 14 CFR Part 25<sup>1</sup>.

**2.2** This standard considers chemical, physical, and biological contaminants as well as moisture, temperature, pressure, and other factors that may affect air quality.

**2.3** Because this standard cannot take into account every variable, especially those relating to safe operation of the aircraft, the diversity of sources and types of contaminants in aircraft cabin air, and the range of susceptibility in the population, compliance with this standard will not necessarily ensure acceptable aircraft cabin air quality for everyone.

## 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:** as used in this standard, this term always refers to ambient air supplied to the aircraft cabin by the environmental control system.

**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:** an aircraft engaged in common carriage according to FAA 8300:10<sup>2</sup>.

**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.

**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*.

**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, temperature control, distribution, recirculation, and filtration.

**flight:** a term used in this standard to describe the status of the aircraft anytime it is not in contact with the ground. **Informative Note:** This definition is not necessarily consistent with the FAA definition of “flight operations.”