AIR MANAGEMENT SYSTEMS

Essential systems for a safer, more comfortable flight
Collins Aerospace is a leading supplier of aircraft environmental control systems (ECSs) for military and commercial transport, which include the ATA Chapter 21 systems for air conditioning, ventilation and cabin pressure control systems. Collins Aerospace is pleased to provide this brief summary regarding information on aircraft cabin air quality, with specific emphasis on contamination originating from inside the cabin. A list of noted reference material can be found at the end of this summary.

Three main characteristics of cabin air management systems help mitigate the spread of airborne pathogens within a typical ECS:

1) Fresh air inflow regulations
2) High efficiency particulate air (HEPA) filters for recirculated air
3) Airflow distribution design in an aircraft cabin
A HIGHER FILTRATION STANDARD FOR AIRCRAFT CABIN AIR

FRESH-AIR INFLOW REGULATIONS
Aviation regulatory authorities such as the Federal Aviation Administration and European Union Aviation Safety Agency specify a minimum outside fresh airflow per occupant, based on the maximum number of occupants (0.55 lb./min. of fresh airflow per occupant). In a large commercial passenger aircraft, for example, a typical ECS that adheres to this specification may replace the air occupying the cabin within about 3 minutes, or about 20 changes per hour of the air occupying the cabin. This may vary slightly by aircraft, based on several factors such as the ratio of maximum passenger capacity to total cabin volume, and distribution system layout. By comparison, the general guidance on fresh air inflow for buildings is only four changes per hour.

HEPA FILTRATION OF RECIRCULATED AIR
In some aircraft ECS designs, approximately 50% of the airflow within the cabin is recirculated and mixed with the outside fresh air flowed into the cabin. In some cases, the recirculated air passes through a HEPA filter prior to mixing fresh air with recirculated air. HEPA filters are commonly considered to be an effective way to mitigate virus transmission and are used in hospital protective environments. For comparison, HEPA filters can have a higher filtration efficiency (99.97%) than an “N95” respirator (95%). As is common for larger commercial aircraft, Collins Aerospace products include HEPA recirculation filters as part of the ECS on many platforms such as the Boeing 787. While HEPA filters are common, there may be some older and/or smaller aircraft platforms that do not have HEPA filtration. However, in many cases, there are OE and retrofit products available.
CABIN AIRFLOW DISTRIBUTION

Aircraft cabin air distribution systems often are designed to distribute the airflow from high (crown) to low (floor vents), and not from the front to back of the cabin. One of the reasons for this design is to manage emergency situations such as smoke events to ensure smoke does not permeate throughout the aircraft cabin. This design has the added benefit of reducing the spread of unfiltered, contaminated air throughout the cabin, but it does not eliminate the risk completely.

Collins Aerospace’s air management systems are designed to meet customer requirements for efficiency, reliability, weight, performance, safety and maintainability. We offer advanced air management systems that enable a safer, healthier and more comfortable environment during flight.

Visit collinsaerospace.com to learn more

REFERENCES AND ADDITIONAL PUBLIC INFORMATION SOURCES

1. Federal Aviation Administration Regulations, 14 C.F.R. § 25.831(a); European Union Aviation Safety Agency, Certification Specifications, CS-25.831(a)
2. ASHRAE 62.2-2016
4. American Society for Healthcare Engineering – Hospital HEPA usage in “protective environment” rooms https://www.ashe.org/compliance/ec_02_05_01/01/airfiltration
5. FDA website – N95 Respirators and Surgical Masks (Face Masks) https://www.fda.gov/medical-devices/personal-protective-equipment-infection-control/n95-respirators-and-surgical-masks-face-masks#3