

# Custom-controlled climate on airplanes

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In each of three different "flights" test subjects could attain their personalized indoor climate settings. © Fraunhofer IBP

The indoor climate on airplanes is a frequent source of complaints. In the future, passengers should be able to set their own individualized climate and temperature controls and also be able to adjust air supply to their own personal preference. At the ILA Berlin Air Show from September 11 - 16, among other things, researchers will be presenting an

airplane seat that is able to provide for these settings.

Start your vacation as soon as you walk into the airplane. But the [indoor environment](#) inside these metal birds often leaves much to be desired: while it's too cold for him, it's too dry for her; is there more fresh [air](#), and can you make it cooler? Also the low humidity may still cause dissatisfaction among several passengers. This may all change in the future: until now, indoor climate could only be set by the main controls, but soon, the passenger will be able to modulate it individually – from the temperature, to the speed at which fresh air flows in, and even the humidity in the air. Because the temperature and humidity that different people find comfortable varies widely.

## **More comfort through seat heating and ventilation, and adjustable air supply**

The technologies that are needed for this purpose is currently being developed by the researchers at the Fraunhofer Institute for Building Physics IBP in Valley, working in a consortium – together with nine partners from universities and the [aviation industry](#) – through iSPACE, a project funded by the EC. All that you need to regulate indoor climate individually, explains Dr. Gunnar Grün, head of department "indoor climate" at IBP: "You need various components that we engineered within the consortium. Humidifier units deliver greater humidity; air purifier technologies filter unwanted substances from the air; optimized vents allow fresh air to flow in, and the passengers can set their own personal comfort temperatures through the seat heaters, just like the ones we find in cars today. And there is seat ventilation that draws in heat and moisture between body and seat, thus keeping the seat comfortably cool."

Fraunhofer researchers have devoted their attention primarily to the

supply of fresh air. Until now, passengers could only manipulate an air jet in the ceiling. The majority of passengers shut these off right when the flight begins, because it blows air directly onto their heads, creating heavy drafts and additional noise. The scientists have now developed other alternatives: they have integrated air inlets into the seat's armrests, into the back rests of the seat in front and, in first class, also into gooseneck cables that currently house the reading lamps. Researchers initially simulated the airstreams that blow out of the various air inlets. Which geometry is best suited for these air inlets? How fast should the air flow out, so that it does not blow on the passengers or cause their skin and mucous membranes to lose too much moisture from the blowing speed, while allowing the optimal exchange of ambient air? Here, the researchers identified an area that allows passengers to regulate the air current themselves. In addition, the scientists have simulated and studied the "age" of air particles and studied how long the air remains within a certain region with particular ventilation systems.

## **Practice tests in the aeronautics lab**

The systems that delivered the most promising results in the simulations were then subjected to a practice "live" testing by the researchers, at the Flight Test Facility in Valley. Located in an enormous hall is a 30-meter long low-pressure tube that, in turn, houses the front end of an Airbus A310. The low pressure tube makes it possible to drop the pressure to 150 hectopascals – and thus, replicate an altitude of up to 13,000 meters. Even the temperature and humidity during the "flight" are set so that they simulate those that would be found on a real flight. The researchers and their partners have installed their engineering advances into this airplane. To test these technologies, about 50 test subjects participated in each of three different "flights." Inside the airplane cabin, at an ordinary "cabin pressure altitude" of 2,100 meters, the "passengers" could test which system best enabled them to attain their personalized indoor climate settings.

**More information:** Visitors of the ILA Berlin Air Show, from September 11 - 16, will be able to try out the airplane seat – including testing seat heating and ventilation, as well as various air outlets. Nonetheless, it may still take a few years until these technologies are installed on airplanes.

Provided by Fraunhofer-Gesellschaft

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