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Condensation in aircraft
Rain in the plane

Jetliners suffer from too much moisture and their passengers from too little.

Since people are made largely of water, transporting 350 of them thousands of kilometres through the air in a metal canister is a sweet business. On average, each person on board a commercial airliner gives off 100 ml of moisture every hour.

That means a jumbo collects some 600 litres during a 17-hour transpacific flight, much of it as condensation in the gap between cold outer skin of the aircraft and the insulated cabin wall. Meanwhile, the people who have sweated off this moisture are being tortured by a cabin atmosphere that is too dry. Its relative humidity is around 20%. Comfort demands a figure near 40%.

CTT Systems, a Swedish company founded ten years ago by two SAAB aircraft mechanics, sees an arbitrage opportunity in these two facts. By adapting some 70-year-old Swedish air-conditioning technology, it has created a system that dries the air in the cavity between the hull and the cabin walls, while keeping the cabin itself comfortably moist.

CTT's Zonal Drying System takes the moist air leaving the cabin and feeds it through a rotor impregnated with silica gel. This removes the moisture. The dry air is then blown between the cabin wall and the aircraft's skin, for absorbing any condensation that has formed there.

Then, a stream of warm air is run through the rotor unit in the opposite direction. This absorbs the moisture from the silica gel and feeds it back into the cabin whence it came, keeping the passengers comfortable.

Passenger comfort is important, of course. But condensation in the gap between cabin and hull can be lethal. This gap contains much of an aircraft's wiring, and water can damage that wiring's insulation. Such a problem is thought to have contributed to the loss of a Swissair DC-11 off the Atlantic coast of America a few years ago. Too much condensation causes other difficulties, as well.

There have been cases when ice has built up inside the tailplanes of aircraft, causing their rudders to freeze and thus preventing their pilots from steering them.

There is also the matter of weight. An aircraft such as Boeing 747-400 can accumulate as much as 700 kg of condensation before it reaches equilibrium. Even though that is only about 0.17% of the 400 tonnes such an aircraft weighs fully laden, it is enough to cause problems for the pilot when he tries to trim the balance of the aircraft.

And 700 kg is about the weight of nine men. So the aircraft is carrying the equivalent of at least nine non-fare-paying passengers, in an industry where every extra kilogram affects fuel consumption and profit margins.

So far, CTT Zonal Drying Systems have been installed by Swissair, KLM and Lufthansa, to deal with specific dampness problems in particular aircraft in their fleets. This costs between \$40,000 and \$120,000, depending on the size of the aircraft. Now, Airbus Industries is planning to build the moisture arbitrageurs in at the factory. It will offer the Zonal Drying System as an optional extra on its long-haul A330 and A340 models.