

## It's Curtains for Mosquitoes and Flies

# Air curtains keep pests out of airplanes

**P**esty mosquitoes can really travel—but not always under their own power. Sometimes they hitch a ride inside commercial aircraft, and that can lead to international problems.

That's because mosquitoes and other flying insects may pose

a threat to public health, agriculture, and the environment. International air travel and the mobile nature of the world economy present serious challenges and responsibilities for those involved in transporting people and cargo.

Mosquitoes are particularly worrisome because their blood-feeding requirements make them ideal carriers of many diseases of humans and animals.

So the U.S. Department of Transportation (DOT) approached Agricultural Research Service scientists about finding a way to prevent insects from getting inside planes. Recently retired ARS chemist Dave Carlson, entomologist Jerome Hogsette,

and colleagues in the Mosquito and Fly Research Unit at Gainesville, Florida, took on the challenge.

### Current Practice Draws Complaints

Mosquito dispersal via aircraft has been well documented as have confirmed cases of airport-originating malaria in Europe.

“Those incidents have led some countries to require destruction of any insects present on arriving international flights by applying a pesticide before landing and passenger disembarkation,” says Hogsette. This process is known as “disinsection.”

According to DOT senior policy analyst Arnold Konheim, “About 12 years ago, DOT initiated efforts to convince countries to drop the requirement that arriving flights be disinsected using chemicals.”

While the efficacy of these agents themselves has been evaluated extensively, tests have shown the results of disinsection to vary with the insecticide, kind of insect targeted, method of insect exposure, and location of the insects in the aircraft.

There are also health concerns connected with exposing passengers to the treatments.

Konheim says that “complaints arising from airline personnel and passengers concerned about use of these chemical pesticides are what prompted DOT to explore viable alternatives.”

**Jerry Hogsette (left), entomologist, and Dave Carlson, retired chemist, discuss the placement of air curtains at a doorway to prevent entry of insects into the room just inside. Depending on their location, the air curtains can prevent insects from entering the building or prevent them from leaving.**



PEGGY GREB (D753-1)

Hogsette and Carlson's strategy was to determine whether commercially available "air curtains" could prevent mosquitoes and flies from entering an aircraft when passengers do. Their system relies on fast-moving, outwardly directed currents of air to keep insects from flying into the aircraft. The reasoning was, if no insects get on the plane, there's no need to spray passengers before they get off. Air curtains are currently used by stores, restaurants, and hospitals to keep conditioned air inside and insects outside.

### Choosing Test Pests

The Gainesville scientists built a test facility made up of two pairs of windowless, corrugated aluminum buildings. One building of each pair served as the simulated aircraft and the other as the simulated passenger-boarding bridge. By using two complete units, they could test two different groups of air curtains at the same time.

"We selected three species of mosquitoes for testing, because each has unique host-seeking behavior," says Hogsette. "That behavior affects where the insects will be found in association with human hosts and how they may be affected by air currents."

*Aedes aegypti* is an easily disturbed species that transmits yellow fever and dengue. It attacks mainly around the feet and lower part of the body. *Anopheles quadrimaculatus* is a malaria carrier that generally attacks the upper torso. While it tends not to bite in broad daylight, once it attaches to skin or clothing, it may be difficult to dislodge. The third mosquito, *Ochlerotatus taeniorhynchus*, is a persistent, biting salt marsh species that attaches mostly to the area from the mid-torso to the head. It will cling tightly to the body and follow moving hosts very aggressively.

As a good example of a robust flying insect against which to compare the weaker flying mosquitoes, house flies (*Musca domestica*) were also included in the tests.

### A Big Whoosh!

The Gainesville researchers positioned three air curtains, one horizontally and two vertically, just as they would be at the doorway of an aircraft. The airflow from the vertical air curtains was directed at a 45-degree angle across the doorway. The curtains, blowing nearly 6,000 cubic feet per minute, prevented 95 to 99 percent of mosquitoes and flies from gaining access

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**Dave Carlson uses balloons to check airflow patterns of the air curtains positioned vertically on either side of the doorway. When positioned correctly, the air curtains will prevent the passage of essentially all flies and mosquitoes into the adjoining room.**

to the test airplane cabin, according to Hogsette.

But countries concerned about accidental introduction of insectborne diseases want assurance that any insects that may be on an arriving plane will not get off.

For example, Jamaican health officials are interested in trying Carlson and Hogsette's approach to prevent insects from escaping from incoming flights. Currently, in-flight spraying of passengers, crew, and crew quarters is done to prevent accidental introduction of invasive insect species into Jamaica.

### What's on Board Stays on Board

The ARS scientists are now testing the air curtain's ability to blow hitchhiking insects back into the airplane cabin during passenger disembarkation. Then, net curtains and screens impregnated with safe-to-handle pesticides would be placed across the front and rear exit doors to prevent any insects remaining on the vessel from departing. Aerosol sprays could then be applied after all crew and passengers had left the aircraft.

Jamaican health officials visiting the Gainesville laboratory have been encouraged by the demonstrations of the air curtain system. "We've already tried the air curtains on aircraft at Orlando International Airport and the results were quite good," says Hogsette. "Our next step is to go to Jamaica to use air curtains on the aircraft there."

"The units only cost about \$1,800 for a pair. This is a fairly inexpensive way to prevent unwanted insects from flying off planes," says Hogsette. "Air curtains can provide a viable alternative to chemical sprays that currently raise concerns."—By **Sharon Durham, ARS.**

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