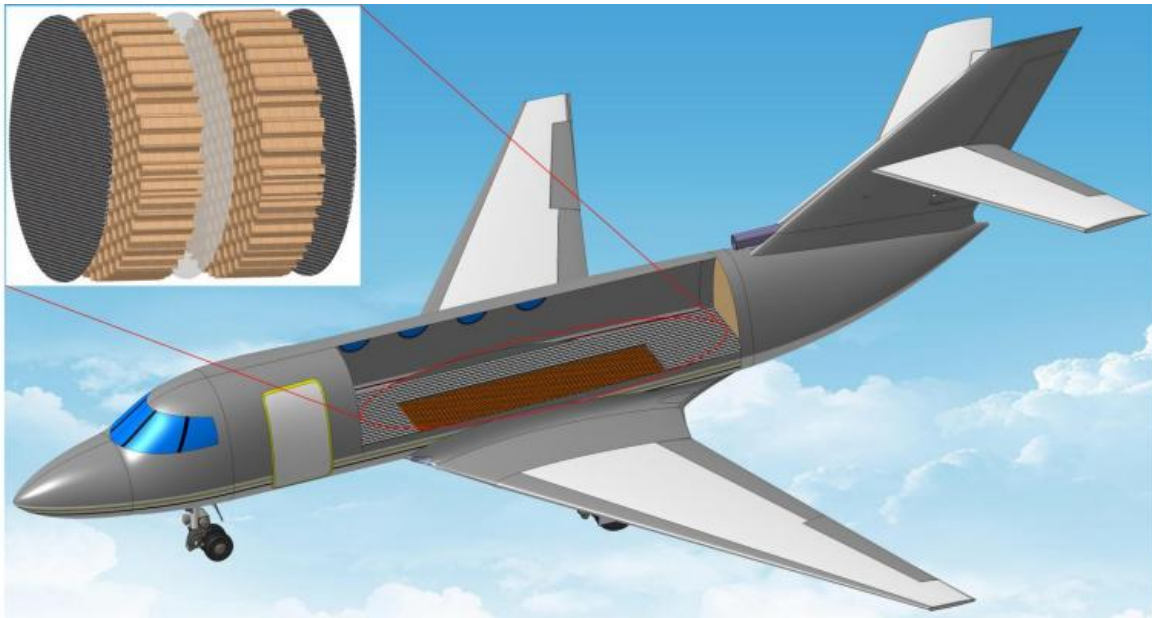


Lightweight membrane can significantly reduce in-flight aircraft noise

April 27 2015, by Matt Shipman



Researchers have developed membranes that can significantly reduce aircraft noise when inserted into the honeycomb structures used in aircraft design.

Credit: Yun Jing, North Carolina State University

Riding in a helicopter or airplane can be a noisy experience for passengers. But researchers from North Carolina State University and MIT have developed a membrane that can be incorporated into aircraft to drastically reduce the low-frequency noise that penetrates the cabin.

"This design is promising for making structures that are strong, lightweight, and sound-proof," says Yun Jing, an assistant professor of mechanical and [aerospace engineering](#) at NC State and senior author of a paper describing the work.

Aircraft designs incorporate light materials with a [honeycomb](#)-like structure into their wings and cabins. It's the material that makes up the floor and ceiling of most airplane cabins. The sandwiched [honeycomb structure](#) makes it strong, and the light weight makes the aircraft more fuel efficient.

But these honeycomb structures are very bad at blocking low-frequency noise - like the noise of an aircraft engine. And adding insulation materials to limit the noise would add significant weight to the [aircraft](#), making it much less fuel efficient.

NC State and MIT researchers have developed a possible solution.

They have created a thin, lightweight membrane that covers one side of the honeycomb structure, like the skin of a drum. When soundwaves hit the membrane, they bounce off rather than passing through.

"It's particularly effective against low-frequency noise," Jing says. "At low frequencies - sounds below 500 Hertz - the honeycomb panel with the membrane blocks 100 to 1,000 times more sound energy than the panel without a membrane."

The membrane is made of rubber that is about 0.25 millimeters thick, and adds approximately 6 percent to the overall weight of the honeycomb panel.

"The [membrane](#) is relatively inexpensive to produce, and can be made of any material that does not impact the structural integrity of the

honeycomb panel," says Ni Sui, a Ph.D. student in Jing's lab and lead author of the paper. "It could make flying much more pleasant for passengers -particularly in helicopters."

The paper, "A Lightweight yet Sound-proof Honeycomb Acoustic Metamaterial," is published online in *Applied Physics Letters*.

More information: *Applied Physics Letters*,
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