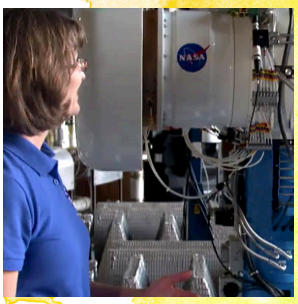
National Aeronautics and Space Administration

Danielle Koch

Aerospace Engineer



Lexile Ranges
Level 1: Less than 810
Level 2: 810-1000L
Level 3: 1010-1200L
Level 4: 1210-1400L

Level 2

FLIGHT LOG ENDORSEMENT CODE: LRDANIK

Educational Product	
Educators & Students	Lexile Level: 810-1000L

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NASA's Danielle Koch is wired for sound – and finding ways to make things quieter.

No matter where she is, Danielle listens for the sounds that surround her. She might hear a gentle breeze at the top of a mountain. She might hear the roar of an airliner's jet engines during takeoff from an airport. Sounds intrigue her.

What do you hear right now? Is the room quiet, or noisy? Are you surprised by any of the sounds you hear? Whether you live in the city, suburbs, or out in the country, sounds of all kinds surround you too.

People react differently to different sounds. If you love airplanes you may think the sound of a jumbo jet flying overhead or racing down a runway is music to your ears. Others consider jet engine noise to be a nuisance. They want it to go away, or at least be quieter.

As a researcher who works for NASA, that is what Danielle does. She leads a team of engineers who study ways to reduce engine noise by designing, building, and testing new parts that can be installed in an airplane's engine to do the job.

She calls her work "an engineering journey."

She has gone from the top of a mountain range in rural Oregon, to sitting on soggy wet soil surrounded by tall grass reeds, to a dome-shaped NASA sound laboratory in Ohio that looks like a futuristic igloo with a big door.

Inside, 17,000 custom-designed fiberglass wedges are mounted on the dome's walls and floor. These wedges keep sounds from echoing in the dome, making it easier for sound researchers to do their work.

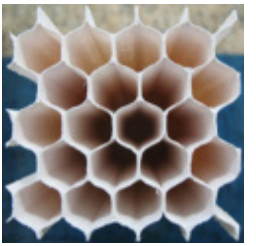
So, how do you make a jet engine quieter? It has taken many years to find out, but there are solutions that work.

During Danielle's search for ways to reduce engine noise, she realized that nature was full of possible solutions. Strolling deep in the forest, for example, she could easily hear the wind blowing through the trees.

Danielle wondered what it was in nature that helped her hear quieter sounds and if she could use those ideas to make airplanes engines less noisy.

One example of something from nature she thought would work was honeycomb. The six-sided structure made popular by honeybees is strong and light weight.

Danielle and her colleagues studied honeycombs and found they work quite well as noise insulators. After much testing, they came up with a way to put a layer of honeycomb material inside a jet engine.



This sound-suppressing layer is called an acoustic liner. It surrounds the noisy rotating machinery that is inside a jet engine. The layer makes things quieter for people on the ground as well as passengers on the airplane.

But the honeycomb material is just one idea that works. Danielle is confident other solutions will be found. She believes it is possible to create acoustic liners that will work even better than using honeycomb.

To do this, Danielle is again looking for ideas from nature. This time she's thinking about the tall grass reeds that grow in wetlands. Experiments have shown the reeds are good at absorbing sound.

The problem is reeds are made of grass. They would not last long inside the superhot insides

of a jet engine. But maybe they can create a new material that would act like grass reeds but would not burn up.

She is not giving up though. Trying new things, even when success is not guaranteed, is an important part of Danielle's job as an acoustic engineer. Her job requires her to be a combination of a scientist, inventor, and problem solver. She must be willing to accept failure, too.

When things are not working as hoped, Danielle takes inspiration from the famous pilot Amelia Earhart.

Amelia often tried risky new things during the early days of aviation. But that did not stop her. Amelia once wrote a letter to her husband, saying "Please know I am aware of the hazards. I want to do it because I want to do it. Women must try to do things as men have tried. When they fail, their failure must be a challenge to others."

So, how did Danielle wind up at NASA? Her journey started when she was young and discovered she enjoyed math and science. She wanted to know how things worked. She stayed in school, went to college, and studied hard to earn a degree in engineering.

Another way NASA has reduced jet engine noise, which Danielle helped research, is seen on this Boeing 787. The saw-toothed cuts at the back of the engine change how the jet's hot exhaust mixes with cold outside air. That makes the engine quieter.

Credits: The Boeing Company/Bob Ferguson

Now Danielle gets to do what she loves every day. She thinks it is important to tell others about her passion, so she spends some of her time talking to younger students.

She hopes students will realize how rewarding a career as an engineer can be. If you have an interest in how things work and study hard, perhaps you will become an engineer and come up with a whole new way to make airplane engines quieter.

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NP-2024-01-3215-HQ

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