TiiMS and NASA-Langley developing structure for noise reduction in commercial aircraft

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(Phys.org) —A team from the Texas Institute for Intelligent Materials (TiiMS) at Texas A&M University along with researchers from the ASME Active and Multifunctional Materials Technical Committee at NASA-Langley have begun collaborations on the development of a new implementation of shape memory alloys (SMAs) for the purpose of reducing airframe noise.

The leading-edge-slat device of high-lift systems for typical transport aircraft is a prominent source of localized unsteady flow with aeroacoustic consequences that contributes significantly to environmental noise in the vicinity of airports. One solution first proposed a decade ago is the concept of a slat-cove filler (SCF), which greatly reduces these aeroacoustic effects by eliminating a key structural cavity and many of the accompanying unsteady flow mechanisms. Practical implemental of this concept has proven difficult, however, due to the substantial geometric change that is required during the transition from cruise to/from takeoff and landing.

Researchers at NASA LaRC, led by Travis Turner, have developed a highly deformable SCF concept enabled by pseudoelastic SMAs. Bench-top models have been developed to demonstrate concept feasibility and explore the parametric design space.

To expand and improve these efforts, TiiMS researchers Darren Hartl

(TEES Assistant Research Professor and TiiMS Director of Operations) and Will Scholten (aerospace engineering senior) have developed a high-fidelity and fully-parameterized computational representation of this novel device. The TiiMS team has begun the process of analysis-driven design exploration using a combination of commercial, open source, and custom-created tools. According to Dr. Hartl, "The efforts of Will have resulted in both an optimized design for the bench-top prototype being further developed at NASA Langley, as well as a comprehensive understanding of design trends that may facilitate implementation of a pseudoelastic SMA, slat-cove filler on future transport aircraft." Preliminary results have validated the accuracy of the computational framework as a valuable alternative to physical prototyping of complex morphing structures.

This work will continue this summer as Will Scholten as been granted a second consecutive summer of support through the NASA Langley Aerospace Research Summer Scholars (LARSS) program. Dr. Hartl is clearly a strong supporter of this research opportunity, saying "All aerospace engineering students in our department should be actively applying for positions through the LARSS program. It is a great way to obtain real-world engineering research experience."

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