

Sound Monitoring and Control for NASA's Spacecrafts



Name of Technology:

Acoustic Monitoring and Control

Participating NASA Centers:

JSC(Lead); ARC, GRC

Technological Area:

O3.06 Advanced Acoustic Monitoring Technologies

Vision for the Technology:

Noise levels on the International Space Station (ISS) frequently exceed the hazard level threshold for brief durations due to operational hardware such as fans, vacuum cleaners, etc. as well as failing hardware and maintenance activities. Acoustic monitoring is conducted once per month and provides only a snapshot of the acoustic environment on the ISS. Low-mass solutions for acoustic monitoring and control are needed to better understand and control the acoustic environment, to protect crew hearing, and to enable communication and alarm audibility.

Challenges:

Currently, acoustic monitoring is performed by using a hand-held sound level meter (SLM) that is moved to 60 different locations where a 15 second measurement is collected. Each SLM survey session takes 2 hours of crew time, and the survey is performed once every 2 months. Therefore, it is important to reduced crew time to perform this task. The crew will continue to be exposed to high levels of noise without

recognizing the risk. This could result in temporary or long-term hearing loss. Lack of quieter fans and light-weight sound blocking materials will increase the mass and volume of noise controls on spacecraft/stations on Lunar and Mars missions.

NASA Seeks to Meet the Following Specs:

An acoustic monitoring and control system is needed to be:

1. Development of sound blocking materials capable of demonstrating >30 dB insertion loss at 125 Hz, from sound blocking materials,
2. Development of small fans that produce sound levels <54 dBA at 2 ft,
3. Development of prime mover fans that produce duct-borne sound power levels <75 dB of without acoustic treatment,
4. Demonstration of an acoustic monitoring system that provides (nearly autonomous) measurement frequency of >30 times per month.

Overview of Student Project:

Innovative low-mass solutions for acoustic monitoring and control are needed to better understand and control the acoustic environment, to protect crew hearing, and to enable communication and alarm audibility. Passive, light-weight sound techniques and materials are needed to dampen sound.

Innovative Areas Student Projects Can Address:

- ◆ Autonomous acoustic monitor,
- ◆ Noise Hazard Level Indicators,
- ◆ Active noise control fans,
- ◆ Quiet (e.g. Prandtl) blades fans,
- ◆ Quiet prime mover fan design technology,
- ◆ Light-weight and anti-microbial passive acoustic materials development

**Research Funded by NASA on this
Topic:**

Proposal Number: 10-1 O3.06-9114
[Acoustic Monitoring for Spaceflight Vehicle
Applications](#)

References:

[O3.06 Advanced Acoustic Monitoring
Technologies](#)

[X12.04 Advanced Environment
Monitoring and Control](#)

[Astrobee: Autonomous Acoustic
Monitoring](#)