AEROSPACE

Revolutionizing Rocket Noise Research with GRAS Microphones

CUSTOMER
Brigham Young University (BYU)

PERSONS
- **Dr. Kent Gee**, Department of Physics and Astronomy at Brigham Young University (BYU).

PRODUCT
GRAS 40BE
GRAS 40BH
GRAS 40AZ
GRAS 26AC
GRAS 26CB
GRAS 12AK
Custom GRAS Multi-Microphone Probes

GRAS
An Axiometrix Solutions Brand

Customer

Dr. Kent Gee, Department of Physics and Astronomy at Brigham Young University (BYU), has dedicated years to studying rocket noise to better understand its source and propagation. His research supports acoustic measurements of some of the world's most powerful launch vehicles, including SpaceX's Falcon 9 and Starship Super Heavy, as well as NASA's Space Launch System (SLS) and Atlas V. His work helps provide a better understanding of the physics behind rocket noise, leading to more informed discussions about the impacts of rocket launches and landings.

Challenge

Rocket noise research is a complex and evolving field. The unprecedented power of SpaceX's Starship Super Heavy—the most powerful rocket ever built—presented a unique opportunity to study not only its specific noise profile but also gain broader insights into rocket noise in general. Capturing the noise of such a large rocket involves unique challenges. As Dr. Gee explains, *"High-fidelity measurements are critical. The levels are intense close to the source, and we need to measure frequencies as low as 1 Hz or less to fully capture the rumble, and beyond 20 kHz to represent the shocks that cause the crackling noise."*



SpaceX rocket Falcon 9

> *I love that they really enjoy a challenge*
>
> Dr. Kent Gee

Why GRAS?

Dr. Gee has relied on GRAS microphones for nearly two decades, citing their outstanding response, sensitivity stability, and quality. Throughout the years, he has worked closely with GRAS engineers—including Gunnar Rasmussen, Per Rasmussen, Lars Winberg, and others—to develop custom microphones and multi-microphone probes for specialized measurement applications. By matching specific microphone types with distinct measurement objectives and locations, GRAS enabled the team to capture the high-fidelity data required under extreme acoustic conditions. As Dr. Gee puts it, *"I love that they really enjoy a challenge."*

Outcome

GRAS microphones yielded invaluable data, enabling Dr. Gee and his team to gain deeper insights into the launch noise and sonic boom generated by the Starship Super Heavy booster. Because the same GRAS hardware has also been used to measure rockets such as SpaceX Falcon 9, NASA's Space Launch System (SLS), and Atlas V, the team can confidently compare acoustic data across different launch vehicles. These consistent, high-fidelity measurements have furthered the understanding of rocket noise, paving the way for more informed discussions and potential solutions regarding the impacts of rocket launches and landings.

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GRAS Products for Rocket Acoustics

Rocket launch noise measurements demand instrumentation that delivers exceptional accuracy across an extremely wide dynamic and frequency range while withstanding the highest sound pressure levels. GRAS offers a comprehensive portfolio of microphones and accessories designed for these demanding applications, including:

GRAS 12BE

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- **GRAS 40BE ¼" High-Frequency Microphone Set**
  – Ideal for capturing the high-frequency shock waves and crackling noise generated during rocket launches.



GRAS 12BH

Read more ad GRAS webpage >

- **GRAS 40BH ¼" High-SPL Microphone Set**
  – Designed for accurate measurements in extreme sound pressure environments close to the launch pad.



GRAS 12AZ

Read more ad GRAS webpage >

- **GRAS 40AZ ½" Low-Frequency Microphone Set**
  – Enables reliable measurements down to **1 Hz**, making it well suited for capturing the powerful low-frequency rumble produced during launch.





GRAS 26CB

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- **GRAS 26CB and 26AC Preamplifiers** – Deliver the stability, dynamic range, and reliability required for high-intensity outdoor acoustic measurements.

GRAS 12AK Power Module

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- **GRAS 12AK Power Module** – Provides signal conditioning for precision microphone systems in demanding field applications.

GRAS customization

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- **Custom GRAS Multi-Microphone Probes** – Developed in collaboration with researchers to meet specialized measurement requirements for advanced aerospace and rocket noise studies.



Dr. Kent Gee, Department of Physics and Astronomy at Brigham Young University (BYU),

For nearly two decades, **Dr. Kent Gee** has relied on GRAS microphones because of their **excellent response, sensitivity stability, and quality.** Working closely with GRAS engineers, including Gunnar Rasmussen, Per Rasmussen, and Lars Winberg, he has helped develop custom microphone solutions and multi-microphone probes that enable high-fidelity measurements under some of the world's most challenging acoustic conditions.

For more information, please contact marketing@grasacoustics.com.

About GRAS Acoustics

GRAS is a worldwide leader in the sound and vibration industry. We develop and manufacture state-of-the-art measurement microphones to industries where acoustic measuring accuracy and repeatability is of the utmost importance in R&D, QA and production. This includes applications and solutions for customers within the fields of aerospace, automotive, audiology, and consumer electronics. GRAS microphones are designed to live up to the high quality, durability and accuracy that our customers have come to expect and trust.
GRAS Acoustics is represented through subsidiaries and distributors in more than 40 countries and is part of Axiometrix Solutions, a leading test solutions provider comprised of globally recognized measurement brands.

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