Ensure Mission Success with Vibroacoustic Simulation of Payloads and Launch Vehicles

VA ONE: The Trusted Legacy Software for Pre-Test Analysis in Space Engineering

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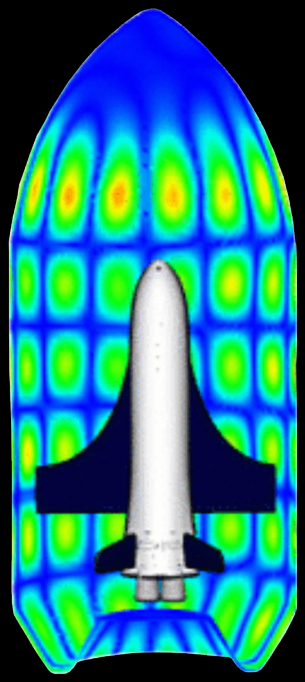
Space Structural Dynamics Simulation Solution | Brochure

Conquer the Complexities of Designing Robust Space Technologies

As space missions become more frequent and complex, the challenges of testing both payloads and launch vehicles intensify. **Increasing launch cadence** puts pressure on **shorter design cycles**, leaving little time for comprehensive, integrated vibro-acoustic analyses. Additionally, the **diversity of launch vehicles** complicates the process, as each has its unique acoustic and vibrational environment. By **improving collaboration between payload and vehicle teams**, and maximizing resources, engineers can confidently **ensure the robustness** of new space technologies, even within **tight timelines and budgets**.

Discover more



Low-frequency acoustic mode simulation of a rocket fairing in VA ONE.
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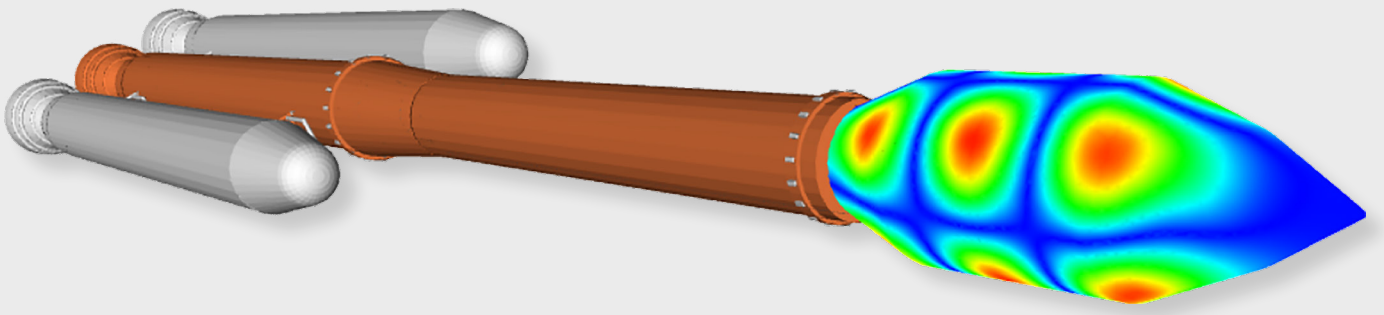
Achieve Multi-Standard Compatibility with Vibroacoustic Simulation

When developing space technologies, payloads must adapt to the varying vibroacoustic conditions of different launch vehicles. Simultaneously, launch vehicles must be designed to minimize excessive stress on payloads. Addressing these challenges requires **virtual vibroacoustic simulation**, which enables combined **analysis of structural dynamics** at critical stages of design and development.

By allowing engineers to **evaluate both launch vehicles and payloads**, these simulations can accurately predict how each will perform in real-world environments, significantly reducing the risk of costly failures during physical testing. These **pre-test simulations serve as a safety net**, helping to optimize sensor placement, fine-tune test conditions, and determine if further adjustments are necessary—mitigating the risk of under- or over-testing hardware.

ESI VA ONE is a comprehensive vibroacoustic simulation software that provides an efficient, accurate approach to testing space technologies. With a **40-year legacy in international space projects**, ESI has consistently proven its ability to meet the diverse and stringent requirements of global space organizations. VA One integrates multiple simulation techniques, empowering engineers to confidently ensure their designs meet the highest standards while **reducing reliance on expensive physical prototypes and test facilities**.



Finite Element Analysis of acoustic performance inside a rocket fairing.
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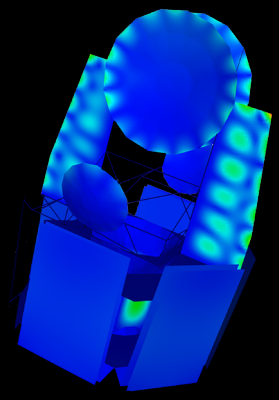
Key Applications

Apply SEA, Hybrid, and FE methods to assess the strength of acoustically sensitive structures during launch, flight, and deployment by validating Sound Pressure Levels, dynamic stresses, accelerations, strain, and forces across the full frequency spectrum.

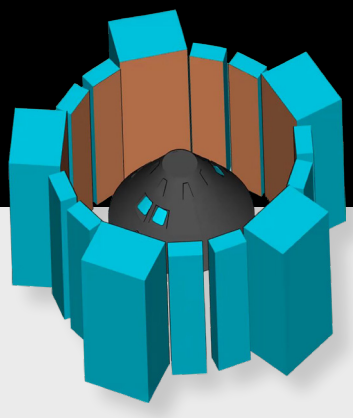


Use Ray Tracing to accurately simulate liftoff acoustic load on the fairing, enabling full-frequency analysis of complex models with minimal computational cost.

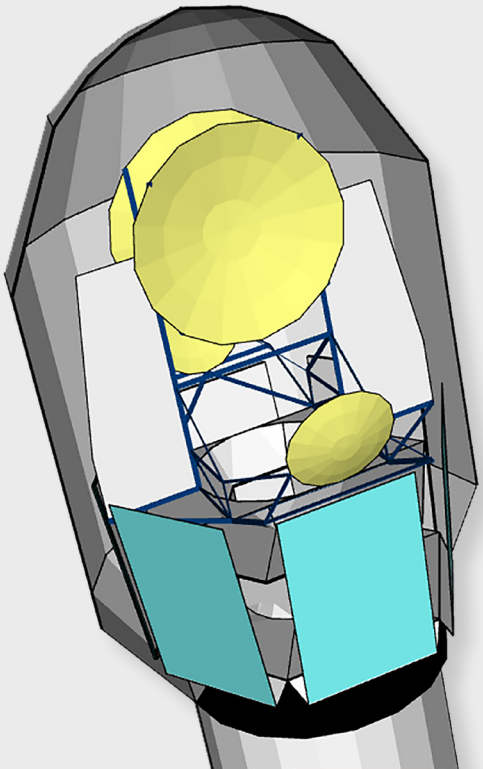
Simulate diffuse acoustic fields to pre-qualify spaceflight hardware, assess structural integrity, and optimize designs early in the design cycle.

Analyze Aero-Vibroacoustic (AVA) effects during ascent phase by coupling vibracoustic simulation with CFD to account for pressure fluctuations, characterized by Wavenumber-Frequency Spectrum.

Prepare for your on-site DFAT® by simulating a diffuse acoustic field, testing different speaker configurations, and delivering **pre-test structural qualification**—without needing specialized acoustic reverberation rooms and **avoiding the risks and costs of transporting** sensitive components to remote test facilities.



Predict **high-frequency shock** effects on space components using VA ONE's Shock Module, SEA capabilities, and Virtual Modal Synthesis and Simulation (VMSS) to **ensure component integrity during rocket separation**.



Using VA ONE to create a SEA model of a satellite for analyzing vibroacoustic perfromance at high frequency.

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The Space Industry's Preferred Choice.

Key Benefits of ESI's Vibro-Acoustic Simulation Software

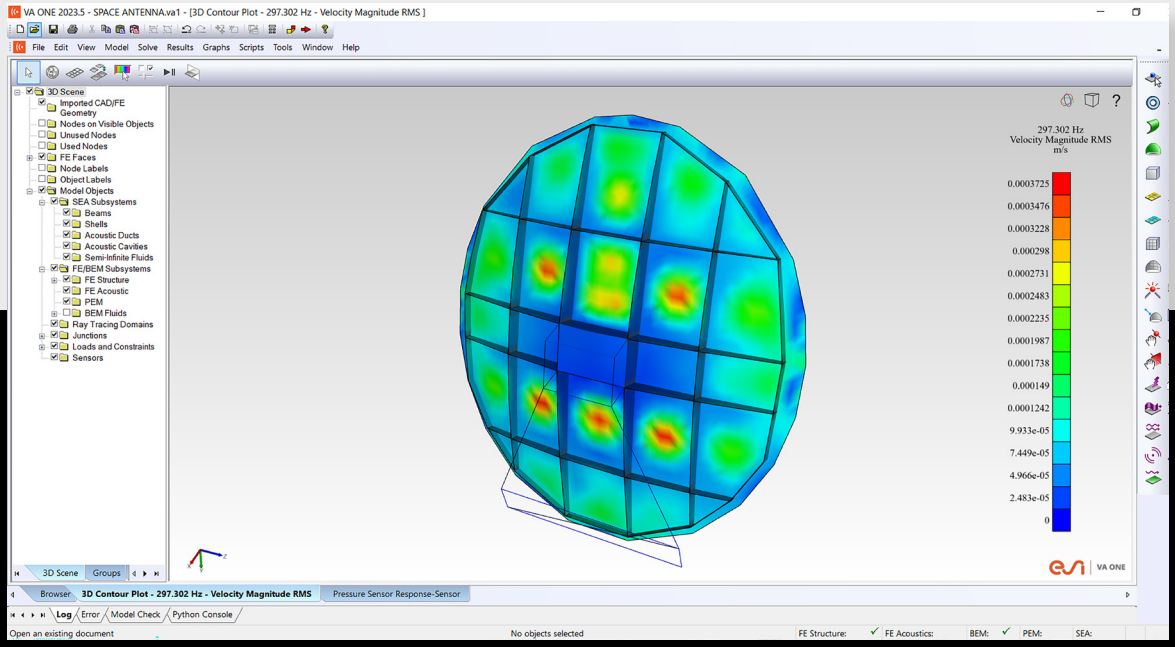
Rapid Design Iteration: Accelerate design revisions by simulating various configurations, providing early confidence in meeting performance criteria and preventing costly redesign delays.

Integrated Analysis for Full-System Validation: Simulate payload and launch vehicle dynamics simultaneously to predict real-world behavior across all mission phases.

Meet Complex Global Standards: Conduct pre-hardware simulations to test multiple scenarios early, meeting the stringent and diverse requirements of space agencies and operators worldwide.

Long-Term Savings: By simulating worst-case scenarios and vehicle conditions, reduce the risk of costly delays, redesigns, or launch failures—saving time and resources.

Avoid Under- or Over-Engineering: Run pre-test validations to predict how both the payload and launch vehicle will perform, optimizing sensor placement and reducing the need for excessive physical tests.



Analyzing the vibroacoustic response of an antenna subjected to diffuse acoustic field loading to optimize performance and ensure structural integrity. © ESI Group (a part of Keysight Technologies), 2025

"When it comes to pre-test analysis, VA ONE is trusted by engineering review boards globally and has become the space industry's instrument of confidence."

Alexis Castel
Technical Expert for Aerospace Vibroacoustics, ESI Group

With decades of experience, VA ONE enables accurate vibroacoustic simulations, helping you confidently meet stringent industry standards while optimizing both payload and launch vehicle designs.

Looking for ways to meet global space standards more easily, reduce physical testing, and accelerate design cycles? Discover how simulating high-frequency acoustic stress, shock response, and full-system dynamics with VA ONE can drive your space project's success.

Contact us today!

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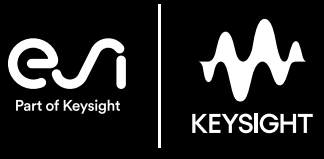

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Keysight is an S&P 500 company delivering market-leading design, emulation, and test solutions to help engineers develop and deploy faster, with less risk, throughout the entire product lifecycle.

For further information, go to: www.esi-group.com