# Space Launch System Scale Model Acoustic Test Ignition Overpressure Testing

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The overpressure phenomenon is a transient fluid dynamic event occurring during rocket propulsion system ignition. This phenomenon results from fluid compression of the accelerating plume gas, subsequent rarefaction, and subsequent propagation from the exhaust trench and duct holes. The high-amplitude unsteady fluid-dynamic perturbations can adversely affect the vehicle and surrounding structure. Commonly known as ignition overpressure (IOP), this is an important design-to environment for the Space Launch System (SLS) that NASA is currently developing.

Subscale testing is useful in validating and verifying the IOP environment. This was one of the objectives of the Scale Model Acoustic Test, conducted at Marshall Space Flight Center. The test data quantifies the effectiveness of the SLS IOP suppression system and improves the analytical models used to predict the SLS IOP environments. The reduction and analysis of the data gathered during the SMAT IOP test series requires identification and characterization of multiple dynamic events and scaling of the event waveforms to provide the most accurate comparisons to determine the effectiveness of the IOP suppression systems. The identification and characterization of the overpressure events, the waveform scaling, the computation of the IOP suppression system knockdown factors, and preliminary comparisons to the analytical models are discussed.