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Title: 5% Ares I Scale Model Acoustic Test: Overpressure Characterization and Analysis

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During the ignition of a ducted solid rocket motor (SRM), rapid expansion of injected hot gases from the motor into a confined volume causes the development of a steep fronted wave. This low frequency transient wave propagates outward from the exhaust duct, impinging the vehicle and ground structures. An unsuppressed overpressure wave can potentially cause modal excitation in the structures and vehicle, subsequently leading to damage.

This presentation details the ignition transient findings from the 5% Ares I Scale Model Acoustic Test (ASMAT). The primary events of the ignition transient environment induced by the SRM are the ignition overpressure (IOP), duct overpressure (DOP), and source overpressure (SOP). The resulting observations include successful knockdown of the IOP environment through use of a Space Shuttle derived IOP suppression system, a potential load applied to the vehicle stemming from instantaneous asymmetrical IOP and DOP wave impingement, and launch complex geometric influences on the environment. The results are scaled to a full-scale Ares I equivalent and compared with heritage data including Ares I-X and both suppressed and unsuppressed Space Shuttle IOP environments.