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Thermo-mechanical concepts applied to modeling liquid propellant rocket engine stability[1] DAVID R KASSOY, University of Colorado, Boulder (retired), ADAM NORRIS, University of Colorado, Boulder, Applied Mathematics Department — The response of a gas to transient, spatially distributed energy addition can be quantified mathematically using thermo-mechanical concepts available in the literature. The modeling demonstrates that the ratio of the energy addition time scale to the acoustic time scale of the affected volume, and the quantity of energy added to that volume during the former determine the whether the responses to heating can be described as occurring at nearly constant volume, fully compressible or nearly constant pressure. Each of these categories is characterized by significantly different mechanical responses. Application to idealized configurations of liquid propellant rocket engines provides an opportunity to identify physical conditions compatible with gasdynamic disturbances that are sources of engine instability.

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