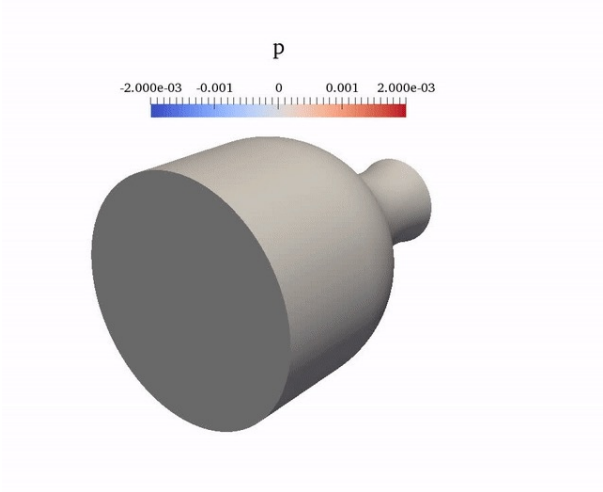
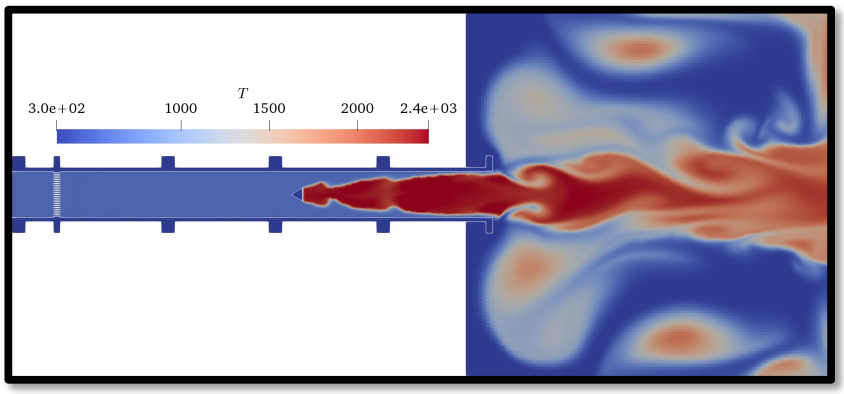
UCDS™ Process with SimDAT™



UCDS Process results



Reduces engine development cost and risk

- Combustion instability (CI) is a critical risk in any propulsion system development.
- Failure to effectively address CI in the design phase greatly increases the likelihood of cost over runs, schedule delays, and program cancelation

Universal Combustion Device Stability (UCDS)

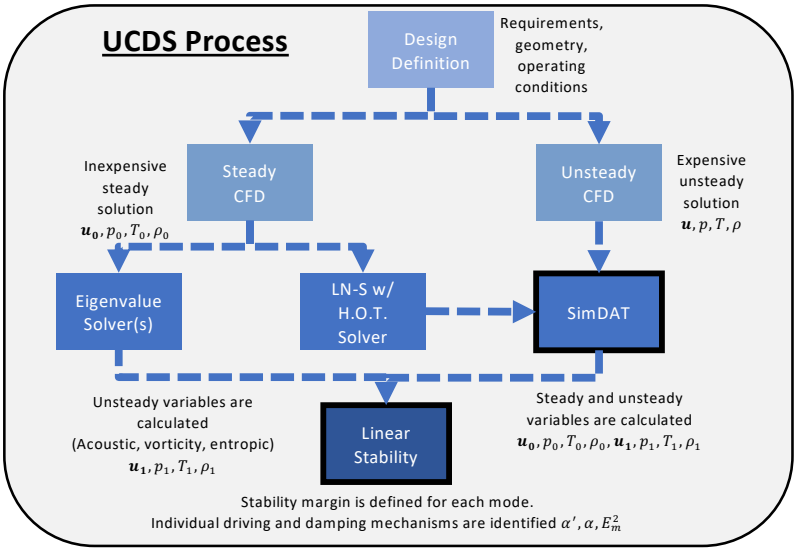
- Suite of Computational Multiphysics Models
- Predictive Analysis
- Liquid rocket engines & Solid motor rockets
- Aircraft turbine engines
- Any combustion device

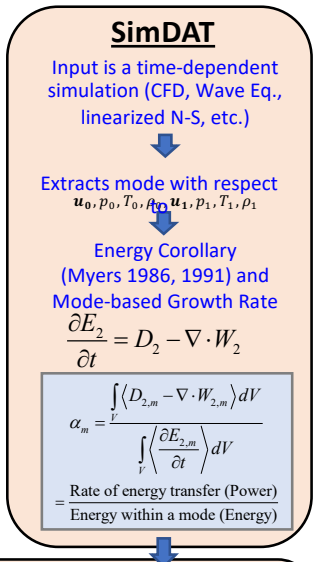
Simulation Data Analysis Tool (SimDAT)

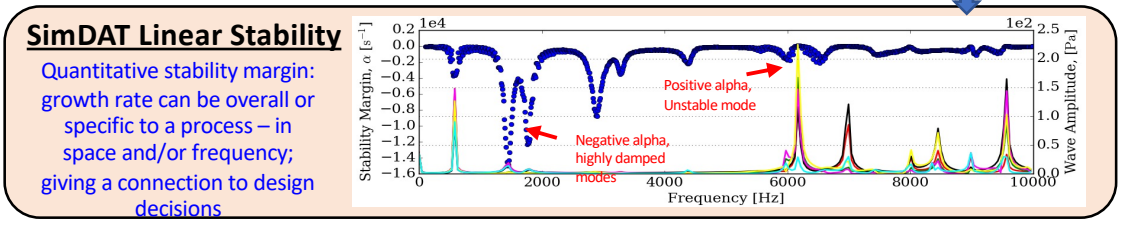
- Suite of Computational Multiphysics Models
- Identify and Quantify Causes of Instability
- Stability displayed in simple-to-interpret maps
- Can be used with any time-dependent CFD

GTL's Universal Combustion Device Stability (UCDS) Process with SimDAT

- Gloyer-Taylor Laboratories (GTL) Software Package
- The General Scaling Theory allows decomposition of the flow field (into steady and unsteady) and results in reduced order models (ROM) - linearized Navier-Stokes, Acoustic Wave Eq., Convected Wave Eq., etc.
- Information about the geometry, bulk fluid motion, and the mode shape are inputs into the Energy Corollary to compute the growth rate
- Simulation Data Analysis Tool (SimDAT) is a specialized tool that:
  - Determines the mode shape from ROM or high-fidelity CFD.
  - Uses the Energy Corollary to compute the growth rate
- This can be applied across the spectrum of any acoustic or other hydrodynamic oscillations in combusting flow







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