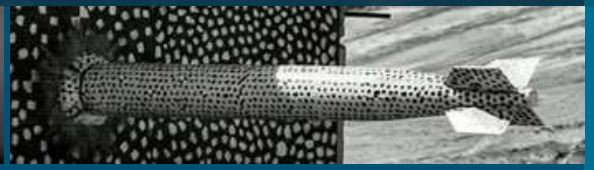
CFD2030 – Aerospace Grand Challenges for Revolutionary CFD Capabilities:

A DOE Perspective on Hypersonics Grand Challenges





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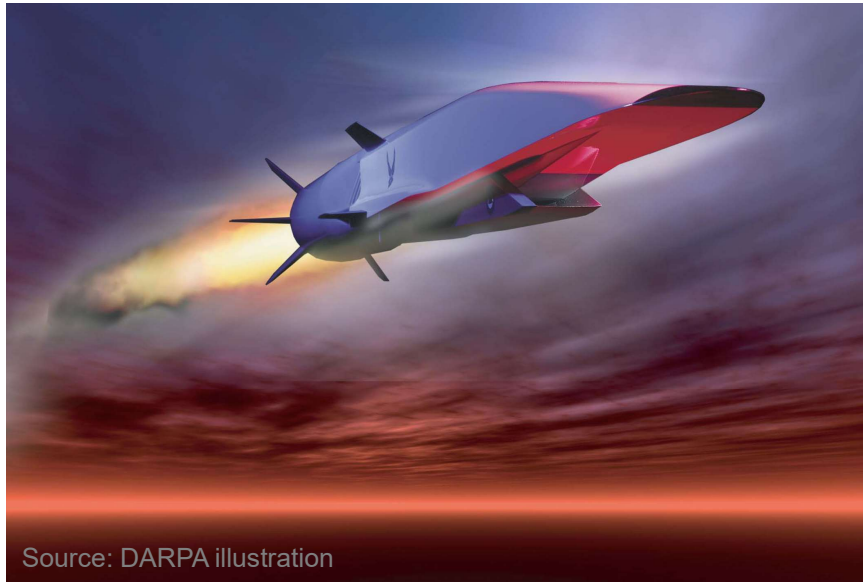
Grand Challenges for CFD and Hypersonics

Boost-Glide Systems

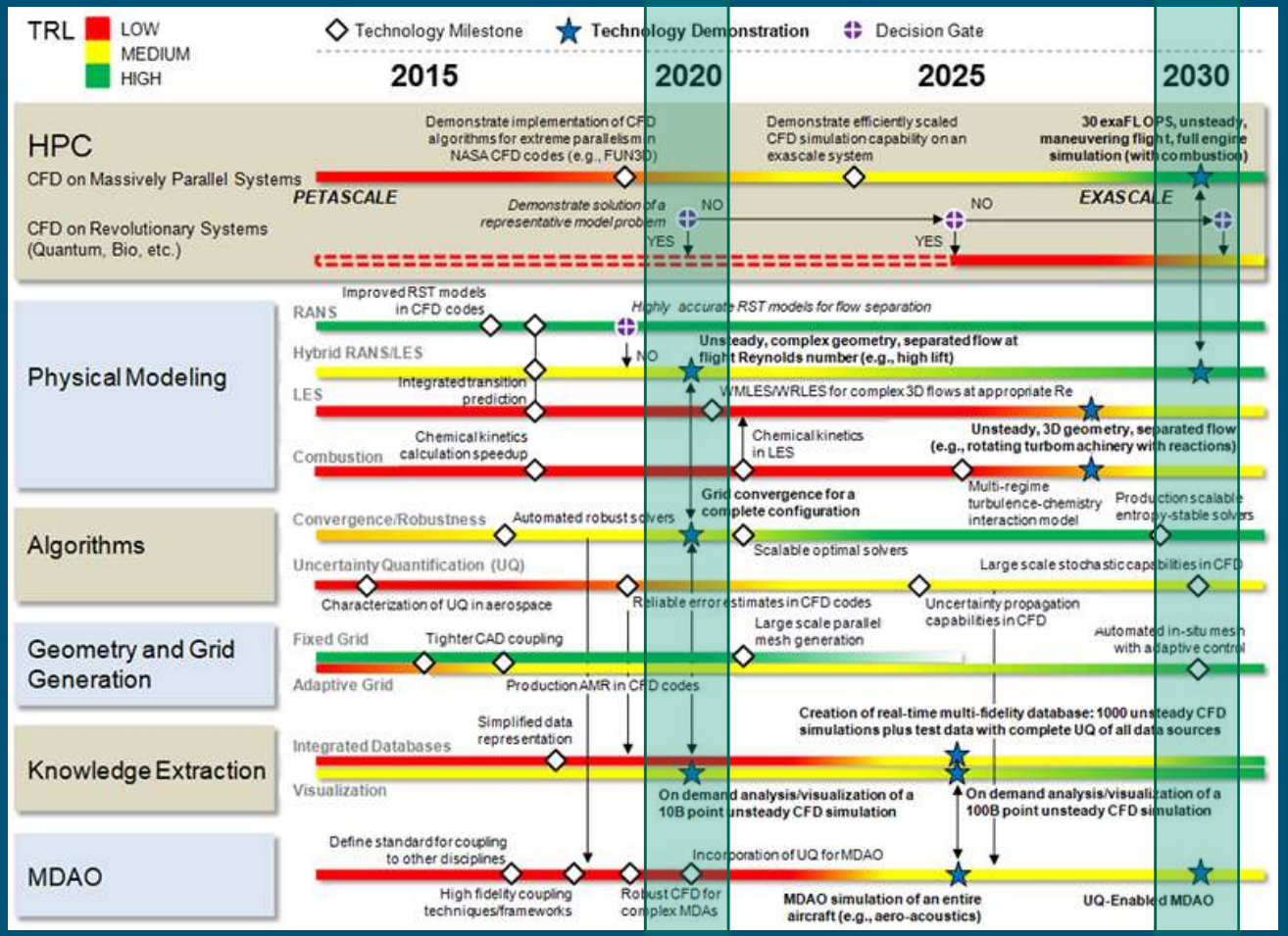


Air-Breathing Systems

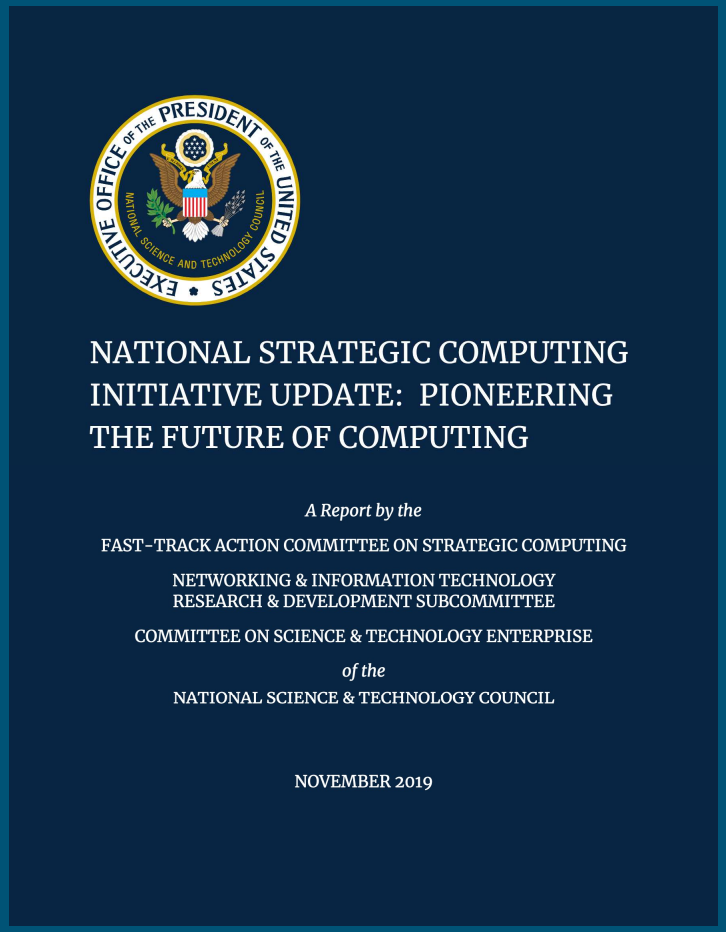
CFD Challenges for Hypersonics

- Large range of spatial and temporal scales
- Multiphysics problems with layers of models
- Discretization accuracy and robustness
- High-quality validation data

The CFD2030 Vision and Hypersonics



Next-Gen High-Performance Computing and Hypersonic CFD

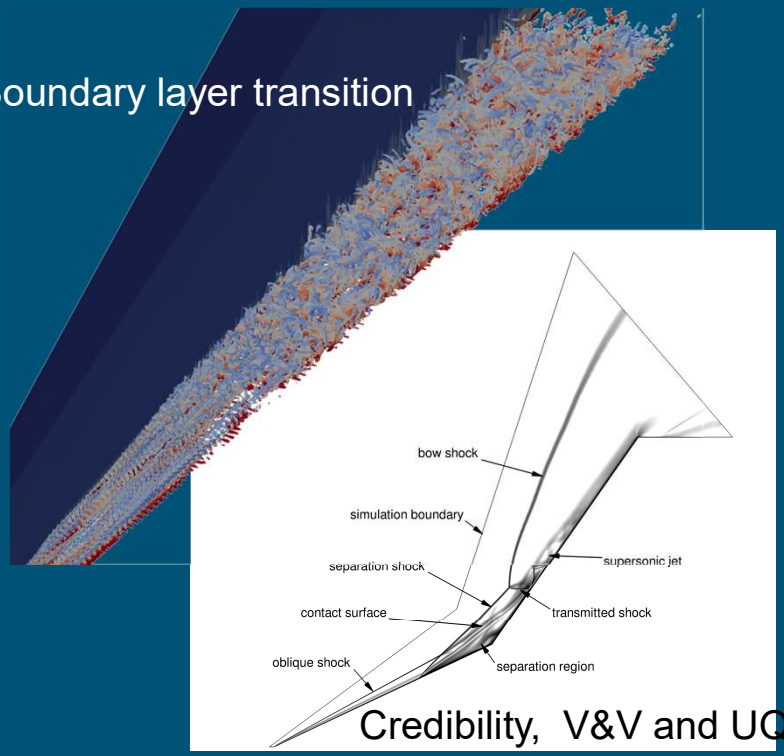


Within DOE/NNSA, this lead to the creation of the SPARC project – a ‘performance portable’ hypersonic CFD code

A Vision for Hypersonic CFD

We envision a credible modeling and simulation toolset to conduct virtual flight tests

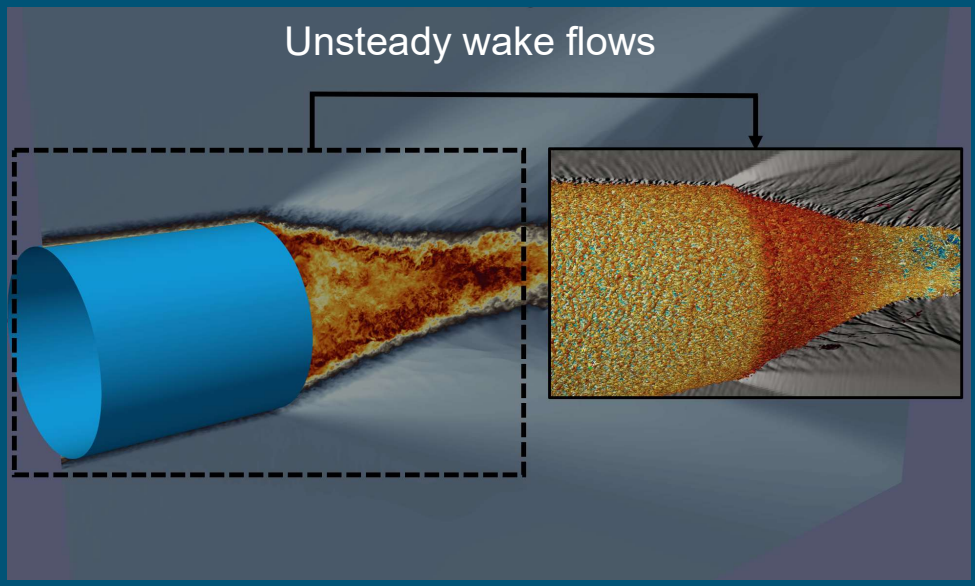
Boundary layer transition



Credibility, V&V and UQ

Gas-phase, gas-surface non-equilibrium chemistry

Ablation, thermal and structural response



HPC, algorithms, physical modeling, data extraction and MDAO *all* underpin this visi