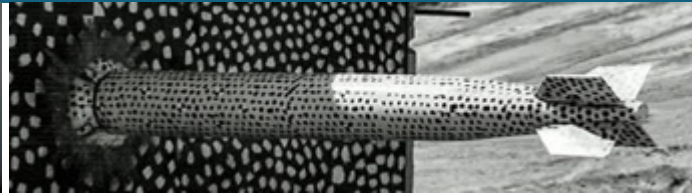
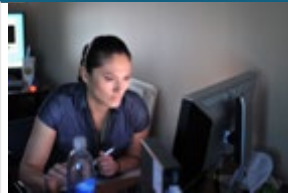
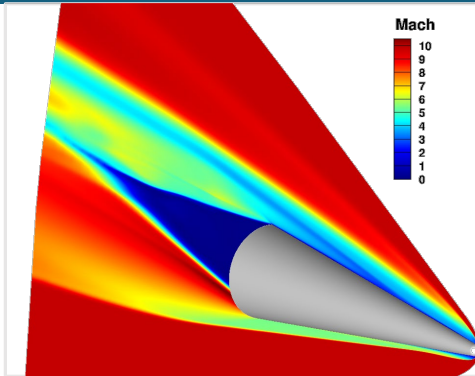
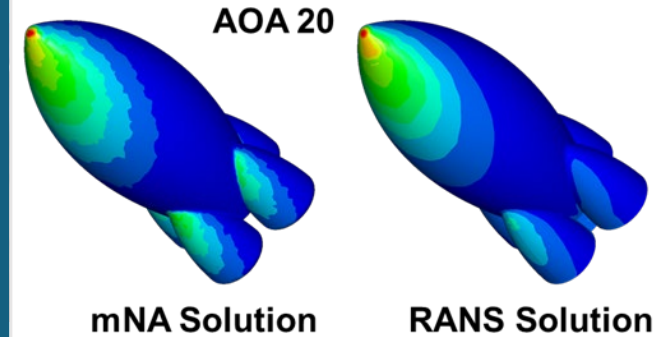




Sandia
National
Laboratories

SAND2020-11604PE

Multi-Fidelity Toolkit (MFTK) Credibility Project Plan



Blake Lance, 2020-11-06

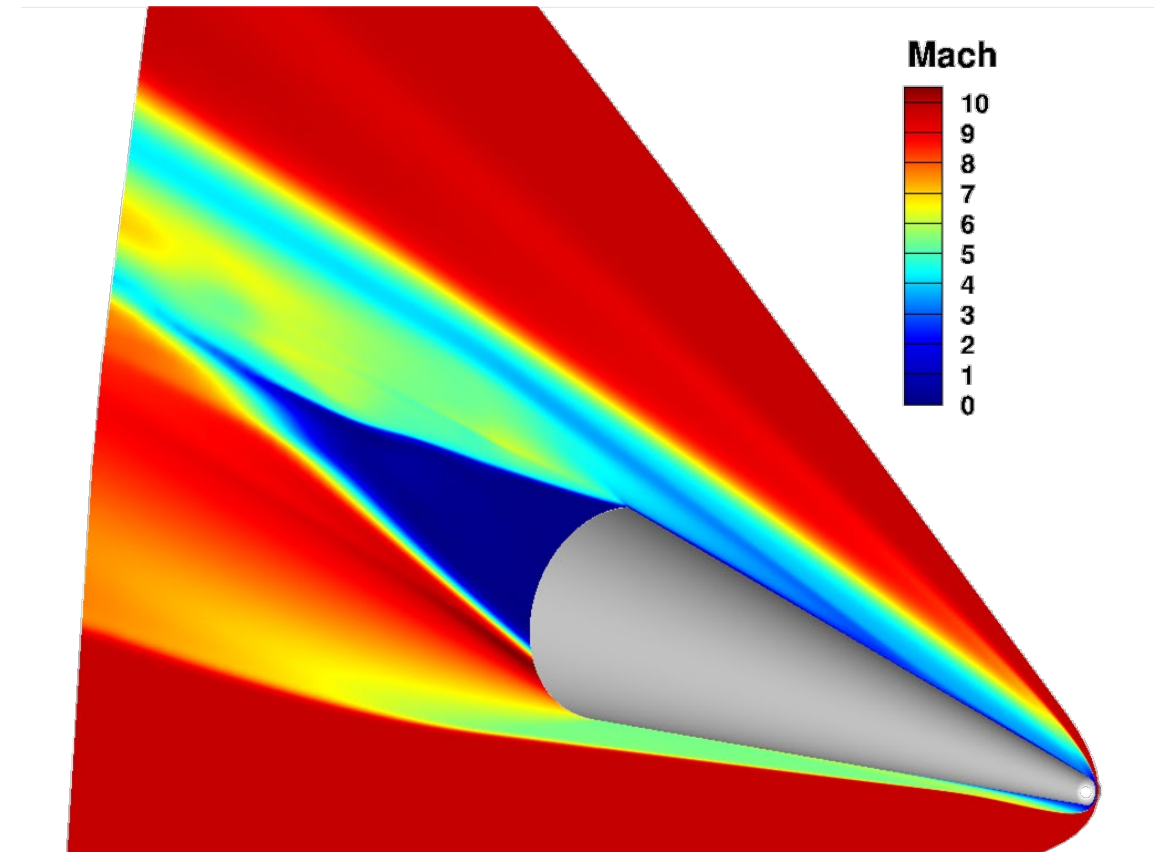


Sandia National Laboratories is a multimission laboratory managed and operated by National Technology & Engineering Solutions of Sandia, LLC, a wholly owned subsidiary of Honeywell International Inc., for the U.S. Department of Energy's National Nuclear Security Administration under contract DE-NA0003525.

Project Purpose



- Purpose: Add value to the Sandia Labs Hypersonics mission by applying credibility processes to the Multi-Fidelity Toolkit (MFTK) and its applications through verification, validation, and uncertainty quantification
- Why: MFTK enables faster execution of hypersonic aerothermal simulations by speeding up the most expensive step



“Hypersonic Research at Sandia National Labs”, Aerosciences Org 1515

Team Members and Funding

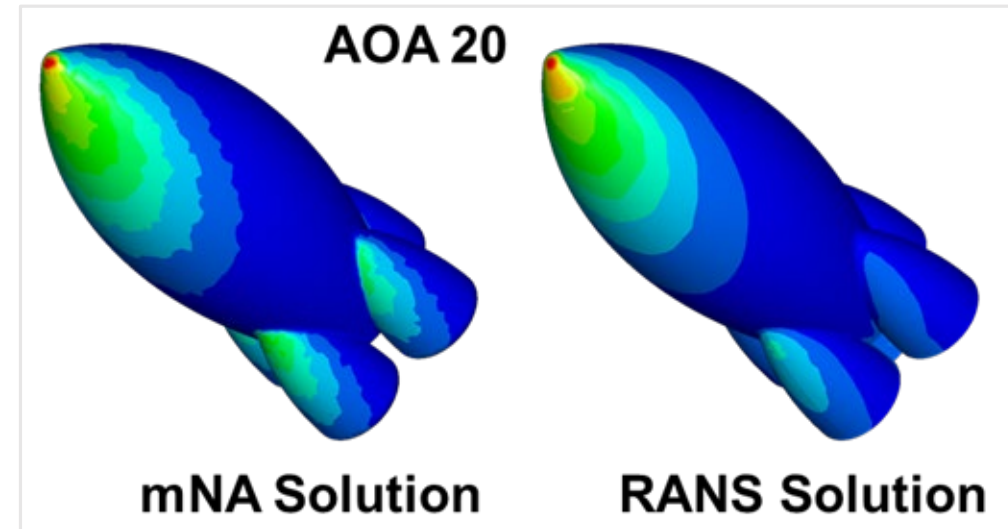


Team

- Brian
 - Verification SME and mentor to Aaron
- Aaron
 - Graduate Student Intern
 - Verification Practitioner
 - Likely to convert to PostDoc in December/January
- Blake (PI)
 - Validation and UQ Practitioner
- Ross
 - MFTK Development PI

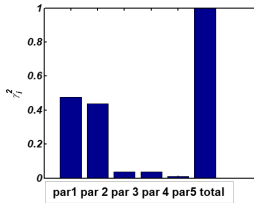
Funding

- Source is DOE-NNSA-ASC-V&V-R&D
- Amount is \$100k for FY21
- Potential for follow-on work

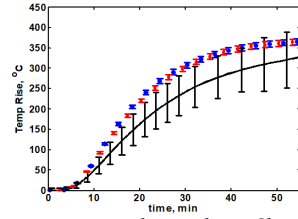


“Hypersonic Research at Sandia National Labs”,
Aerosciences Org 1515

Computational Simulation Credibility Elements



How are uncertainties assessed and reflected in simulation predictions?

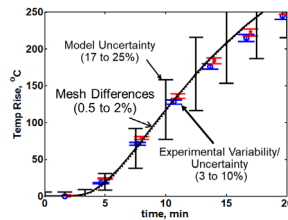


As-Modeled

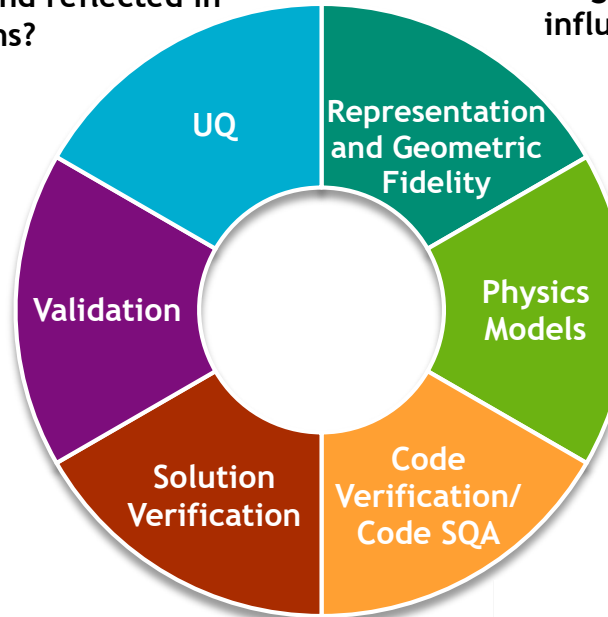
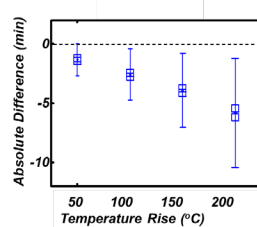


As-Designed

How are geometric feature simplifications influencing simulation results?



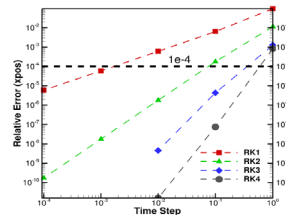
What is the discrepancy between simulation and experiments?



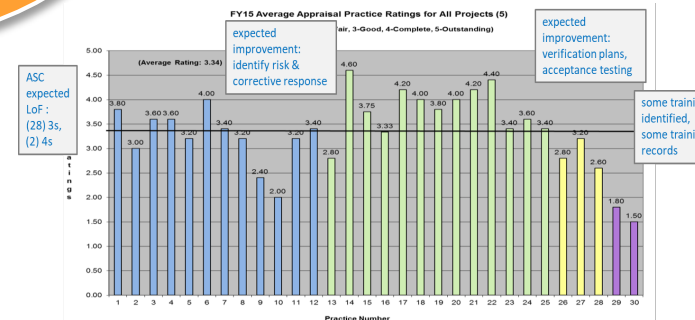
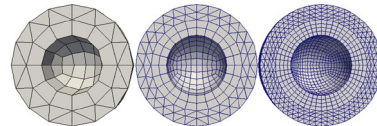
PIRT

Phenomena	Importance	Adequacy for Intended Use			
		Math Model	Code	Validation	Model Parameter
Phenomena 1	H	H	M	L	L
Phenomena 2	M	H	M	L	L
Phenomena 3	L	H	M	L	L

Are important physics models adequate? Key gaps mitigated?



How do numerical solution or human errors affect simulation results?



What is the evidence for code credibility?

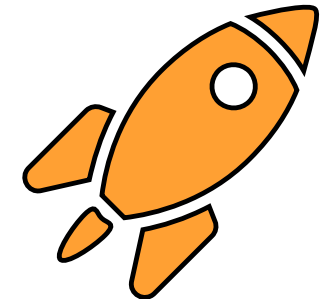
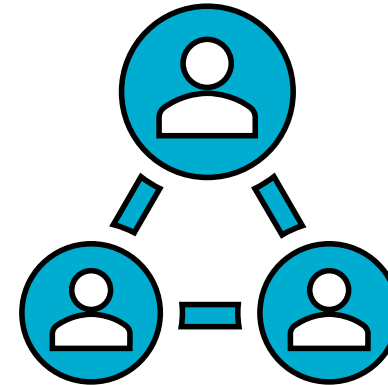
Plan and Budget



- Q1
 - Develop detailed project plan
 - Setup teaming structures (regular meetings, Collaborative, Confluence, budget tracking)
 - Complete Geometric Fidelity and Physics Model evaluations
- Q2
 - Develop verification and validation (V&V) methods
- Q3
 - Implement V&V methods
- Q4
 - Document in final report

○ Budget

- 50% for verification
 - Aaron will do most of the detailed work at a lower rate (intern/PostDoc)
 - Brian will mentor
- 40% for validation and UQ
- 10% for project management



Deliverables and Milestones



Quarterly reports

- 1-2 pages
- High-level
- Budget tracking
- Achievements
- Challenges

News Note

- Optional update for notable accomplishments written for DOE program leadership

Final report

FY20 Quarterly Reporting Input for PEM/VV
VERSION 2017-11-20

The following input is needed for quarterly ASC Program reporting.

PI name: Blake Lance
Program Element (PEM or VV): VV
Project Name: Experimental Credibility
Project/Task No.: 103723/06.20.07

Costs

- Cost as of 2020-09-04, 66k\$ of 75k\$
- End-of-Year Status
 - Estimating project will be close to spent to fill out "What Is" guide

Deliverable Accomplishments

Remember:
✓ Must map each bulleted line item (performance to plan) to a target(s). The targets are listed at the bottom of this page.

- [SNL-V&V-1&2] What is the project deliverable?
 - Completion of background report, "What is" guide, revised framework, outreach
- [SNL-V&V-1&2] Performance to Plan (=Meets)
 - Performed outreach and feedback meetings through Dowding connection
 - Completed EC application meeting with JTA
 - Completed multiple discussions on renaming out naming survey to larger group that could
 - Started "What Is" guide, expected to finish in
- [SNL-V&V-1&2] Exceeds
 - NA
- [SNL-V&V-1&2] Area of Technical Concern or Challenge
 - NA

Risks

Remember:
✓ Risks do not need to change each quarter.
✓ Risk = A potential event that could keep you from meeting your targets.

- Identify at least one risk, but could have more.
 - Background report completion by Kieweg is out of scope, but there is a risk that it will not be completed

Issues, Challenges, Lessons Learned, Continued

Remember:
✓ Issue = A risk that has been realized.

- NA

News Note
(submit separately using either UUR or OOU template)

L2 Milestone

Page 1

SANDIA REPORT
SAND20XX-XXXX
Printed Click to enter a date

SAND Report Title

First name, middle initial, and last name of author(s).

Sandia National Laboratories

Prepared by
Sandia National Laboratories
Albuquerque, New Mexico
87185 and Livermore,
California 94550