

# AIAA SCI-TECH 2014

## 1<sup>st</sup> Sonic Boom Prediction Workshop

### Summary

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# Methodology Assessment

- **Propagation resolution loss is apparent by plotting signature changes with distance and is generally correctable with more analysis resolution, especially from solution adaptation (and possibly a far-field correction method)**
- **Off track resolution can be apparent from a nose shock but can be difficult to establish elsewhere is a signature. Grids and solvers without under track bias are desired.**
- **A small variation in signature level was sometimes seen, particularly in the signature recompression, but also some methods seemed to be consistently slightly higher or lower than the mean. Such variations should be further examined and assessed.**

**Still assessing the large matrix of solution results and their propagation resolution, off track resolution, source of differences and significance of differences.**



# Methodology Summary

- **Key to Prediction Results, A # # #**
  - **1<sup>st</sup> #: Viscous**
  - **2<sup>nd</sup> #: Propagation resolution**
  - **3<sup>rd</sup> #: Off Track resolution**
  - **Letter #1 #2 #3 – Comments**
    - A020 – **Cart3D sharp details under track**; but less off track, no BL
    - B202 – CFD++, small 24 M grid, **excellent test match**; but losing resolution with distance
    - C220 – USM3D, **excellent test match**; but losing resolution off track
    - D000 – Eugenie, **very small 14M grid**; but no BL
    - H022 – Cart3D/Overflow, **very sharp detail maintained off track**; but no BL
    - P220 – FUN3D/CFL3D, **extremely small 5M grid, very regular output, resolved distance**; but less off track and levels high
    - R220 – FUN3D, **sharp strong shocks and strong expansion aging**; but less off track resolution

# Methodology Summary



- **All methods matching well and useable for design and analysis**
- **Excellent results seen with:**
  - **Viscous boundary layer at wind tunnel Re#, but indications it may not be necessary at full scale**
  - **Swept grid efficiency and resolution**
  - **Swept grid off track resolution, but can degrade when grid cone is not centered on shock cone**
  - **Off track is not any less important than under track, so roll angle resolution bias is undesirable**
  - **Solution adaptation can be very sharp in propagation and off track resolution improvement**