DPW-8 & AePW-4

Static Deformation Working Group

July 19, 2024

dpwaiaa@gmail.com
(working group specific email TBD)

Administrative Information

- **Meeting schedule**
  - Third Friday of the month; 10:00 Eastern Time (will adjust with US Daylight Saving Time)
- **AVIATION in-person meeting**
  - Tuesday, July 30 at 7:00 Pacific Daylight Time in Alliance 308 (hybrid option planned)
- **For questions about the working group, please email** dpwaiaa@gmail.com
- **Websites**
  - Static Deformation Working Group website
    https://aiaa-dpw.larc.nasa.gov
  - Geometry/Grid websites
    https://aiaa-dpw.larc.nasa.gov/geometry.html
  - https://aiaa-dpw.larc.nasa.gov/grids.html
  - Postprocessing website (including ONERA OAT15A experimental results)
  - https://aiaa-dpw.larc.nasa.gov/postprocessing.html
  - Large File Upload
  - https://nasagov.app.box.com/f/fd164563283b4e85857d1a0975b0b363

Geometry and Grids

- **Geometry**
  - https://aiaa-dpw.larc.nasa.gov/geometry.html
  - High-quality CAD is being created or already exists, much from DPW-7
  - Available for download from the DPW website and JAXA website (link coming)

- **Common grids are being generated**
  - Strongly encourage use of committee-supplied grids
  - Cadence/Pointwise, Helden Aerospace, NASA Ames (and you???)
  - User's best practices for solvers may require alternate grids
  - Submission to the workshop strongly desires any custom grids to be provided for posting on the website

Test Case 1a: Workshop-Wide Validation

- **Validation of steady CFD analysis, required**

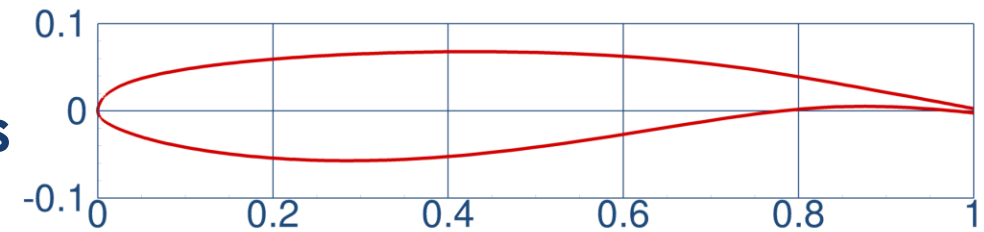- **Users are encouraged to employ best practices**

- **Settings**
  – Steady CFD (e.g., RANS)
  – Prefer some version of SA, multiple turbulence models can be submitted
  – Purely 2D simulations (one cell wide)

- **Grids**
  – Six-member grid family; four are required, six are desirable
  – Encourage use of committee-supplied grids; user-generated grids are acceptable
  – Committee-supplied grid is one cell wide with a 230mm chord (same as experiment) and follows RANS best practices

- **Conditions**
  – Mach 0.73, Re_c=3m (based on chord length), T_{static}= 271 K (487.8 R)
  – Alpha: 1.36, 1.50, 2.50, 3.00, 3.10

ONERA OAT15A Transonic Airfoil

Jaquin, et al. "Experimental Study of Shock Oscillation over a Transonic Supercritical Profiles." AIAA Journal, Vol. 47, No. 9, 2009. Pages 1985-1994.

Test Case 1b: FEM Validation

- **Validation of Structural Model for NASA CRM**
  - Tap Test planned for comparison to normal mode solutions of FEM models
  - Static Loads Tests will be conducted to compare deflection measurements (and maybe twist) to Linear Static FEM solutions

- **Users are encouraged to employ best practices for selected FEM codes**

- **Settings**
  - Linear Eigenvalue Analysis (e.g. NASTRAN® SOL103)

- **Conditions**
  - Rigid suspension at sting

- **Grid**
  - MSC NASTRAN® solid 4-node tetrahedral finite-element structural model
  - Model consists of $6.8 \cdot 10^6$ elements, $4.1 \cdot 10^6$ degrees-of-freedom
  - Supplied by NASA Langley's Configuration Aerodynamics Branch
  - Wind tunnel sting will be added as beam model (date ???)

NASA CRM Structural Model

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