

DPW-8 & AePW-4

Static Deformation Working Group

October 18, 2024

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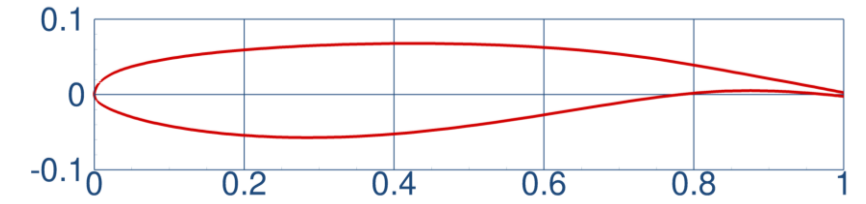
(working group specific email TBD)



- **Meeting schedule**
 - Third Friday of the month; 10:00 Eastern Time (will adjust with US Daylight Saving Time)
- **For questions about the working group, please email dpwaiaa@gmail.com**
- **Websites**
 - Static Deformation Working Group website
<https://aiaa-dpw.larc.nasa.gov/WorkingGroups/Group2/group2.html>
 - 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>

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 RANS 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), $T_{static} = 271 \text{ K } (487.8 \text{ R})$
 - 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.

- **Geometry Webpage**

- <https://aiaa-dpw.larc.nasa.gov/geometry.html>
- Test Case 1a: ONERA OAT15A (**updated Sept 5, 2024**)
<https://aiaa-dpw.larc.nasa.gov/Geometry/ONERA-OAT15A-090524.zip>
- Test Case 1b: NASA CRM FEM Validation
TBD
- Test Case 2: NASA CRM Geometry (from DPW-7)
<https://aiaa-dpw.larc.nasa.gov/Workshop7/DPW7-geom.html>

RANS Committee-Supplied Grids Status

- **The ONERA OAT15A RANS committee-supplied grids have been updated**
 - Intended to be used for RANS
 - Grids are one cell wide
- **Participants are strongly encouraged, but not required to use these supplied grids for RANS simulations**
- **RANS gridding guidelines have been posted to the grids website (v3, July 1)**
 - https://aiaa-dpw.larc.nasa.gov/ref/gridding_guidelines_v3_07012024.pdf

- **ONERA OAT15A grids posted to DPW webpage**

- Helden Aerospace (HeldenMesh)

- https://dpw.larc.nasa.gov/DPW8/Helden_Grids.REV01/Helden-ONERA-OAT15A.zip

- Cadence (Pointwise)

- https://dpw.larc.nasa.gov/DPW8/Cadence_Grids.REV01/Cadence-ONERA-OAT15A_230mmChord_780mmSpan_upZ_2024_09_05_Structured.zip

- https://dpw.larc.nasa.gov/DPW8/Cadence_Grids.REV01/Cadence-ONERA-OAT15A_230mmChord_780mmSpan_upZ_2024_09_05_Unstructured.zip

- ONERA

- https://dpw.larc.nasa.gov/DPW8/Deck-ONERA_Grids.REV00/Deck-ONERA-OAT15A.zip

- **Please follow these instructions:**

- <https://aiaa-dpw.larc.nasa.gov/postprocessing.html>

- **Case 1a**

- Grid Metrics:

- https://aiaa-dpw.larc.nasa.gov/Forms/DPW8-AePW4_CustomGridMetrics_v5.dat

- Force/Moments:

- https://aiaa-dpw.larc.nasa.gov/Forms/DPW8-AePW4_ForceMoment_v5.dat

- CP cuts:

- https://aiaa-dpw.larc.nasa.gov/Forms/DPW8-AePW4_SectionalCuts_v5.dat

- Convergence:

- https://aiaa-dpw.larc.nasa.gov/Forms/DPW8-AePW4_Convergence_v5.dat

- **GitHub is being used to collect data files**

- **Submission Label**
 - <### Participant ID>.<## Submission Number>
- **Participant IDs (3 digits) will be assigned by Working Group leaders**
 - Unique ID
 - One for each combination of Organization/Group of Participants
- **Submission Number (2 digits) label a solver/grid/computational approach**
 - Solver/Grid variations will be tracked with submission numbers
 - If a participant ran multiple turbulence models (SA/SST/SA-RC-QCR) with multiple grid families and solvers for Test Case 1a (ONERA OAT15A), they could use:
 - ###.01 for SolverA on Cadence Unstructured grids with SA-neg
 - ###.02 for SolverA on Cadence Unstructured grids with SST
 - ###.03 for SolverA on HeldenMesh grids with SA-neg
 - ###.04 for SolverB on HeldenMesh grids with SA-neg
 - ###.05 for SolverB on HeldenMesh grids with SA-neg-RC-QCR
 - Submission Numbers may change across Test Cases, Participant IDs will not
 - No need to maintain common Submission Numbers

- **June, 2024**
 - First Working Group Meeting ✓
 - ONERA OAT15A geometry release ✓
- **July, 2024**
 - ONERA OAT15A grids released ✓
 - AVIATION in-person meeting ✓
- **October, 2024**
 - First look of Test Case 2/3 grids
- **Nov 8th**
 - All workshop virtual meeting
- **Winter, 2024**
 - FEM Validation Data released
- **January, 2025**
 - SciTech forum
 - Mini Workshop 1
- **July, 2025**
 - AVIATION in-person meeting
- **Summer/Fall, 2025 (?)**
 - Mini Workshop 2
- **January, 2026**
 - SciTech in-person meeting
- **February, 2026**
 - Delivery of final data set (perhaps alternate submissions prior to this date)
- **June, 2026**
 - Workshop in San Diego, CA

Working Group Meeting Cadence

- **Currently set up for 10:00 Eastern time on third Friday of each month**
 - A suitable meeting time is very difficult for global participants
 - Recurring meeting invite sent
- **Next meeting: Friday, November 15th**
 - Individuals or teams are welcome to present preliminary analysis for test case 1a (ONERA OAT15A Airfoil)
 - Please contact ben.j.rider2@boeing.com if you are interested to present grids or solutions



Static Deformation Working Group Leadership

- **Stefan Keye, DLR**
- **Garrett McHugh, NASA Langley**
- **Ben Rider, The Boeing Company**