DPW7 Cases – Rev H 6/29/2021

Note: The NASA High Speed Common Research Wing-Body configuration is used for all cases (tail, nacelle, pylon not to be included)

1. **CRM Wing-Body Grid Convergence Study:** Use at least 4 grids of the 6-member baseline grid family for this study. - Preferably, we would like Participants to use all 6 members of the Family. Use 3.00-deg LoQ AE CRM geometry

   **Case 1a. Re = 20M (Required):** Flow conditions are: M = 0.85; Re = 20 million; fixed CL = 0.58 +/- 0.0001; Reference temperature = -250°F; 3.00-deg LoQ AE CRM geometry. Grid convergence study on Baseline LoQ R30 grids.

   **Case 1b. Re = 5M (Optional):** Flow conditions are: M = 0.85; Re = 5 million; fixed CL = 0.58 +/- 0.0001; Reference temperature = 100°F; 3.00-deg LoQ AE CRM geometry. Grid convergence study on Baseline LoQ R5 grids.

   Use at least 4 grids of the 6-member baseline grid family for this study. - Preferably, we would like Participants to use all 6 members of the Family.

2. **CRM Wing-Body Alpha Sweep:** Angle-of-attack sweeps will be conducted at two Reynolds numbers using the LoQ aero-elastic deflections measured in the ETW Wind Tunnel Test. Flow conditions are:

   **Case 2a. Re = 20M (Required):** M = 0.85; Re = 20 million, Reference temperature = -250°F. Use Baseline LoQ R30 grids.

   **Case 2b. Re=5M (Optional):** M = 0.85, Re = 5 million, Reference temperature = 100°F. Use Baseline LoQ R5 grids.

   Use the Medium Baseline aero-elastic grids for the appropriate Reynolds number family.

   **Angle of Attack sweep:**
   
   - CL = 0.50  2.50-deg LoQ AE CRM geometry
   - a = 2.75°  2.75-deg LoQ AE CRM geometry
   - a = 3.00°  3.00-deg LoQ AE CRM geometry
   - a = 3.25°  3.25-deg LoQ AE CRM geometry
   - a = 3.50°  3.50-deg LoQ AE CRM geometry
   - a = 3.75°  3.75-deg LoQ AE CRM geometry
   - a = 4.00°  4.00-deg LoQ AE CRM geometry
   - a = 4.25°  4.25-deg LoQ AE CRM geometry

3. **CRM Wing-Body Reynolds Number Sweep At Constant CL (Required):** Flow conditions are: M = 0.85, CL = 0.50, medium grids;
• Re = 5M, LoQ – R5 grid using 2.50-deg LoQ AE CRM geometry, Reference
temperature = 100° F (Same LoQ R5 medium grid solution from Case 2b)
• Re=20M, LoQ – R30 grid using 2.50-deg LoQ AE CRM geometry, Reference
temperature = -250° F (Same LoQ R30 medium grid solution from Case 2a)
• Re=20M, HiQ – R30 grid using 2.50-deg HiQ AE CRM geometry and R30grid,
Reference temperature = -182° F
• Re=30M, HiQ – R30 grid using 2.50-deg HiQ AE CRM geometry and R30grid,
Reference temperature = -250° F

4. CRM Wing-Body Grid Adaptation – Alpha Sweep [Optional]: Angle-of-attack
sweep for the CRM Wing-Body using an adapted grid family provided by the
participant. Flow conditions are: M = 0.85; Re = 20 million; Reference temperature = -
250°F Start the adaptation process from the appropriate Baseline LoQ mesh or
aeroelastic geometry. Additional cases can be run for Re = 5 million; Reference
temperature = 100°F. Participants are to document the adaptation process.

Angle of Attack sweep – (preferred priority):
CL = 0.58 3.00-deg LoQ AE CRM geometry
da = 4.00° 4.00-deg LoQ AE CRM geometry
a = 3.50° 3.50-deg LoQ AE CRM geometry
a = 4.25° 4.25-deg LoQ AE CRM geometry
a = 3.25° 3.25-deg LoQ AE CRM geometry
a = 3.75° 3.75-deg LoQ AE CRM geometry
(Please order results in Angle-of-Attack monotonic order)

5. Beyond RANS [Optional]: Solution technologies beyond steady RANS such as
URANS, DDES, WMLES, Lattice Boltzmann, etc. Flow conditions are: M = 0.85; Re =
20 million; Reference temperature = -250°F. Single solution at CL = 0.58 or alpha
sweep. Baseline grids not provided

Angle of Attack sweep – (preferred priority):
CL = 0.58 3.00-deg LoQ AE CRM geometry
da = 4.00° 4.00-deg LoQ AE CRM geometry
a = 3.50° 3.50-deg LoQ AE CRM geometry
a = 4.25° 4.25-deg LoQ AE CRM geometry
a = 3.25° 3.25-deg LoQ AE CRM geometry
a = 3.75° 3.75-deg LoQ AE CRM geometry
(Please order results in Angle-of-Attack monotonic order)

6. CRM WB Coupled Aero-Structural Simulation [Optional]: Flow conditions are: M =
0.85; Re = 20 million; Reference temperature = -250°F. Use the Medium Baseline NoQ
Re=30M grid. Single solution at CL = 0.58 and/or an alpha sweep, coupled with
computational structural analysis. Static aeroelastic deflections calculated starting from
the undeformed NoQ geometry.
A structural FEM and modal shapes are also available on the CRM Website.

Undeflected NoQ geometry/ grids for NTF Wind Tunnel Model WITHOUT Nacelle/Pylon and tail to be used as a starting point.

**Angle of Attack sweep – (preferred priority):**

- CL = 0.58
- a = 4.00°
- a = 3.50°
- a = 4.25°
- a = 3.25°
- a = 3.75°

(Please order results in Angle-of-Attack monotonic order)