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 R5grids.

   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
a = 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
a = 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

https://commonresearchmodel.larc.nasa.gov/geometry/dpw6-geometries/

A structural FEM and modal shapes are also available on the CRM Website.

https://commonresearchmodel.larc.nasa.gov/fem-file/

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)