DPW-VII
Opening Remarks

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### DPW-VII: Baseline RANS Grid Family Plan

<table>
<thead>
<tr>
<th>Name</th>
<th>L</th>
<th>WB</th>
<th>$\Delta y_1$</th>
<th>$Y^+$</th>
<th>$#\Delta y_1$s</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tiny (T)</td>
<td>1</td>
<td>~5</td>
<td>0.0002332”</td>
<td>~1.00</td>
<td>2</td>
</tr>
<tr>
<td>Coarse (C)</td>
<td>2</td>
<td>~17</td>
<td>0.0001555”</td>
<td>~0.67</td>
<td>3</td>
</tr>
<tr>
<td>Medium (M)</td>
<td>3</td>
<td>~40</td>
<td>0.0001166”</td>
<td>~0.50</td>
<td>4</td>
</tr>
<tr>
<td>Fine (F)</td>
<td>4</td>
<td>~78</td>
<td>0.0000933”</td>
<td>~0.40</td>
<td>5</td>
</tr>
<tr>
<td>Extra Fine (X)</td>
<td>5</td>
<td>~135</td>
<td>0.0000777”</td>
<td>~0.33</td>
<td>6</td>
</tr>
<tr>
<td>Ultra Fine (U)</td>
<td>6</td>
<td>~215</td>
<td>0.0000666”</td>
<td>~0.29</td>
<td>7</td>
</tr>
</tbody>
</table>

**Rough Nominal Size of Grid System in M-DOF**

At Least 4 Sequential Mesh Levels & Bias Towards Finest
DPW-VII: Gridding Guidelines (1/2)

- Tiny Grid
  - Viscous Wall Spacing: \( Y^+ \sim 1.0 \rightarrow \Delta y_1 = 0.0002332'' \)
    - Based on local \( C_f \) @ 10\% \( C_{ref} \) for \( Re_c = 30 \) million
    - \( C_f \sim 0.455 / \ln^2(0.06*Re_x) = 0.003107 \), where \( Re_x = 0.1*Re_c = 3 \) million
    - \( \Delta y_1 = C_{ref} / [Re_c * \sqrt{C_f/2}] = 0.0002332'' \)
  - At Least 2 Constantly-Spaced Cells at Viscous Walls, \( \Delta y_2 = \Delta y_1 \)
  - Growth Rates < 1.2X Normal to Viscous Walls
  - Wing Spanwise Spacing < 0.1\%*Semispan at Root & Tip
  - Wing Chordwise Spacing < 0.1\%*C (Local Chord) at LE & TE
  - Wing TE Base >> 8 Cells
  - Spacing Near Fuselage Nose & End-of-Body < 1\%*Cref

- Grow Next-Finer Grid in Family by \( (L+2)/(L+1) \) in Size
  - Scale Dimensions in All Three Directions by \( (L+2)/(L+1) \)
  - Grid Spacings Should Reduce as follows, (0.1\% in Tiny Grid)
    - \( [T,C,M,F,X,U] = [0.100, 0.067, 0.050, 0.040, 0.033, 0.029]\% \)
• Farfield Boundary > 100*Semispans
• Miscellaneous Notes:
  • Try to be Multigrid Friendly on Structured Meshes
  • Store Grid Coordinates in 64-bit Precision
  • If Storing Grids in Plot3D Format, Keep Zones < 38M Nodes
  • Itemize Surface Elements by Components [W, B, Sym, Far]
  • Itemize Element Count for Unstructured Meshes
    • Volume: Tetrahedra, Prisms, Pyramids, Hexahedra
    • Surface: Triangles, Quads
• Total of 15 Grids Needed per Grid Type
  • Subtotal of 8 AE Medium Grids @ Low-Q for Alpha Sweep
  • Subtotal of 1 AE Medium Grid @ High-Q for Q Effect
  • Subtotal of 1 Medium Grid on Undeflected Geometry for Case 6
  • Subtotal of 6 Grids in Grid Family for Grid Convergence
    • AE3.00degLowQ Geometry, CL = 0.58, Re = 20M, (Re = 5M Optional)