

# Test Case 2b: Wing/Body Polar

- Verification of steady CFD analysis, required
- Settings
  - Steady CFD RANS **French Vanilla SA-[neg] (All terms!)**
    - Adiabatic Wall (not isothermal)
    - QCR is critical to side-of-body at higher AOA – **Recommend adding QCR2000**
  - Converge residuals to machine precision (~1e-10)
- Grids: [https://dpw.larc.nasa.gov/DPW8/Scatter/Test\\_Case\\_2](https://dpw.larc.nasa.gov/DPW8/Scatter/Test_Case_2)
  - NASA CRM geometry including deformed wing matching condition
    - Grid density representative of standard analysis (i.e. L3:Medium)

## Comparison Data

NTF197: r44,r51,r53  
 NTF215: r43,r103  
 NTF229: r296,r300,r302  
 Ames216: r35,r126,r130,r133

*Revision History:*  
 v1: Recommend inclusion of QCR2000

## Reference Units

Sref (semi-span grid)	Cref	Semispan	Moment Center
297360.0 sq.in	275.8 in	1156.75 in	(1325.90, 0.00, 177.95)

## Conditions

Mach	Re <sub>c</sub>	T <sub>static</sub> (100° F)	γ	Pr	Pr <sub>t</sub>	Farfield χ = $\tilde{\nu}/\nu$
0.85	5 × 10 <sup>6</sup>	559.67 R   310.928 K	1.4	0.72	0.90	3
Polar Conditions		α = [2.50°, 2.75°, 3.00°, 3.25°, 3.50°, 3.75°, 4.00°, 4.25°]				

## Sutherland's Law

$$\mu(T) = \mu_0 \left(\frac{T}{T_0}\right)^{3/2} \left(\frac{T_0 + S}{T + S}\right) \quad \mu_0 = 1.716 \times 10^{-5} \frac{\text{kg}}{\text{m s}} \quad T_0 = 491.6^\circ \text{R} \quad S = 198.6^\circ \text{R} \quad \frac{\mu(T)}{\mu_{ref}} = \left(\frac{T}{T_{ref}}\right)^{3/2} \left(\frac{1 + S/T_{fef}}{T/T_{fef} + S/T_{fef}}\right)$$