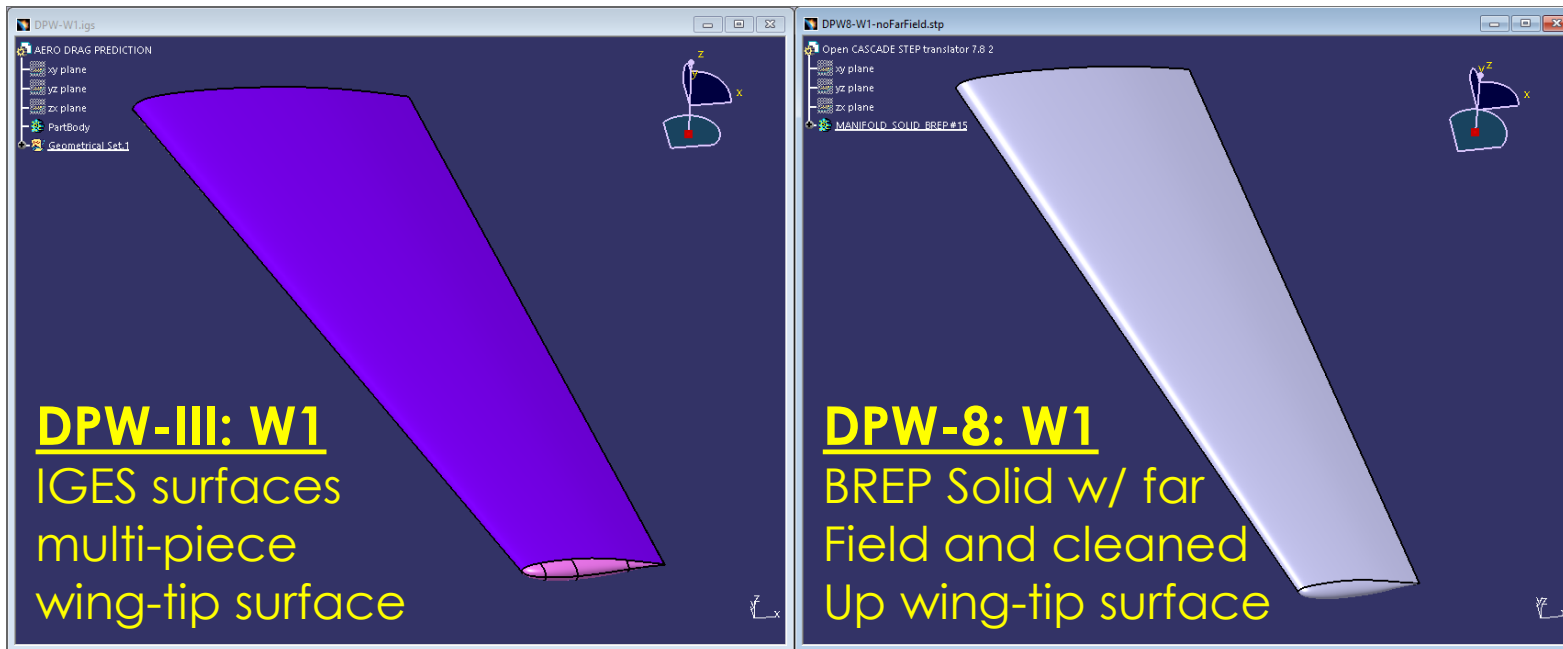
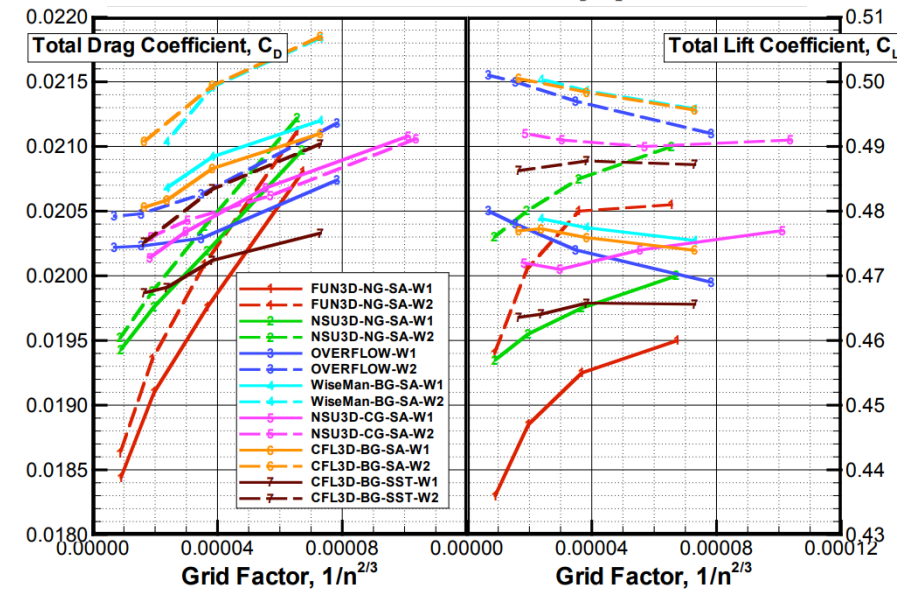
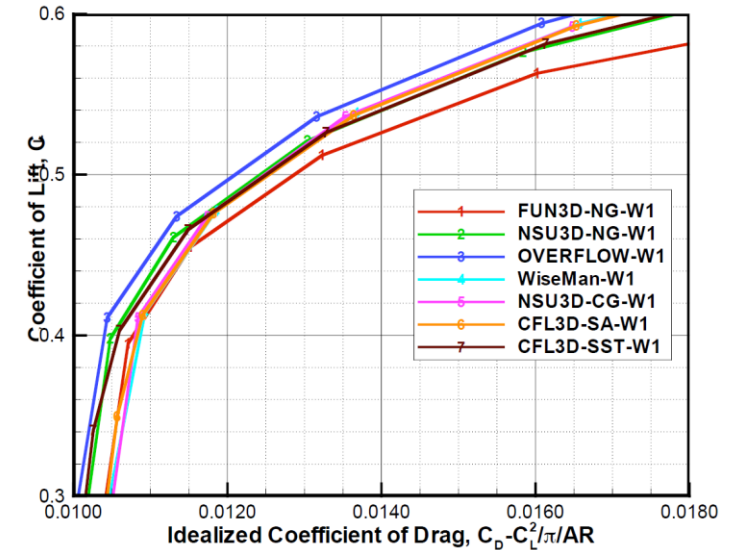


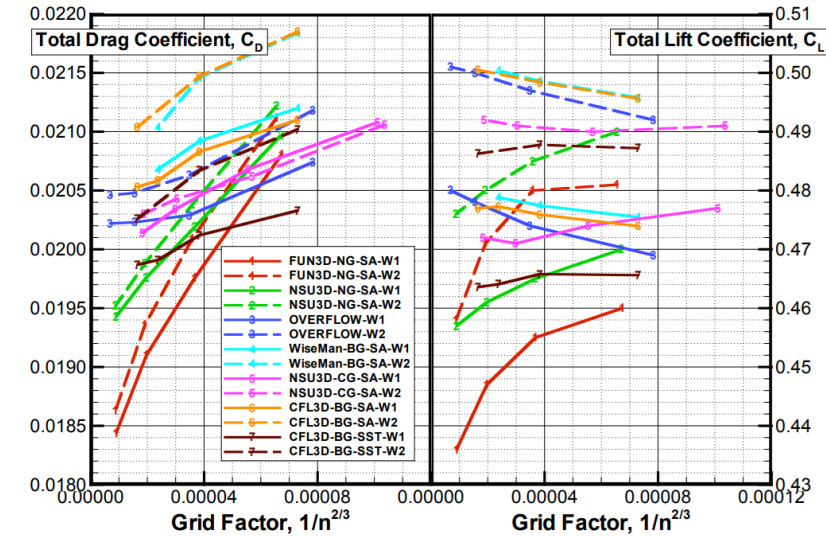
Test Case 1d/1e: DPW-III W1 & W2 (20 years later)

- **DPW-III: Wing-Only Test Case**
 - W1 & W2, including incremental comparison
- **DPW-8: Scatter WG**
 - Revisit Wing Only cases to measure the progress over 20 years



Test Case 1d: DPW-III W1 & W2 (20 years later)

- **Grid Convergence Verification of steady CFD analysis at Mach=0.76: $\alpha = 0.5^\circ$**
- **Settings**
 - Steady CFD RANS **French Vanilla SA-[neg] (All terms!)**
 - Adiabatic Wall (not isothermal)
 - Converge residuals to machine precision ($\sim 1e-10$)
- **Grids: https://dpw.larc.nasa.gov/DPW8/Scatter/Test_Case_3**
 - DPW-III W1 wing-only geometry (with symmetry plane)
 - (L1:**T**iny/L2:**C**oarse/L3:**M**edium/L4:**F**ine/L5:**eX**tra-fine/L6:**U**ltra-fine)
 - Six-member grid family; four are required, six are desirable
 - Encourage use of committee-supplied grids; user-generated grids are acceptable



<https://www.aiaa-dpw.org/Workshop3/presentations/S9-Zickhur-Case2-Summary.pdf>

Reference Units

Sref (semi-span grid)	Cref	Semispan	Moment Center
225.0 sq.in	7.7778 in	30.0 in	(6.0726, 0.0, 0.0)

Conditions

Mach	Re _c	α	T _{static} (120.33° F)	γ	Pr	Pr _t	Farfield $\chi = \tilde{v}/v$
0.76	5×10^6	0.50°	580.0 R 322.22 K	1.4	0.72	0.90	3

Sutherland's Law

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

$T_0 = 491.6^\circ R \quad S = 198.6^\circ R \quad \mu_{ref}$

Test Case 1e: DPW-III W1 & W2 (20 years later)

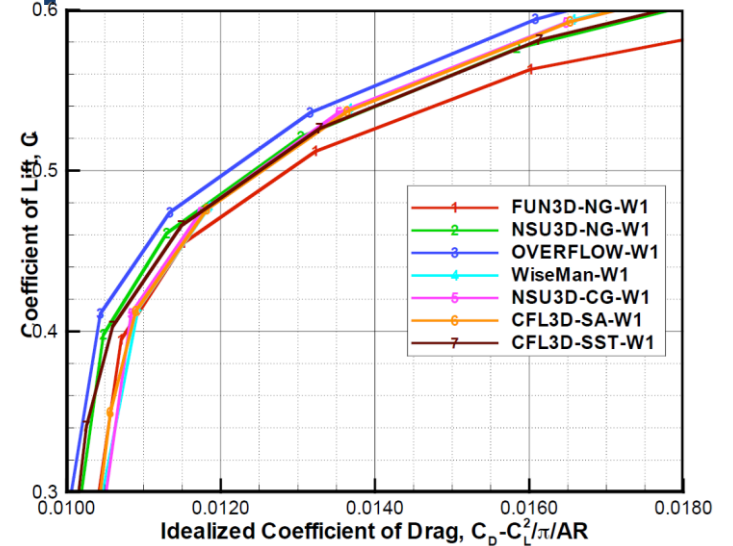
- Drag Polar at Mach=0.76: $\alpha = [-1.0, 0.0, 0.5, 1.0, 1.5, 2.0, 2.5, 3.0]$

- Settings

- Steady CFD RANS **French Vanilla SA-[neg] (All terms!)**
 - Adiabatic Wall (not isothermal)
- Converge residuals to machine precision (~1e-10)

- Grids: https://dpw.larc.nasa.gov/DPW8/Scatter/Test_Case_3

- DPW-III W1 wing-only geometry (with symmetry plane)
 - Use finest affordable mesh (Recommend at least L3:**Medium**)
 - $\alpha = [-1.0^\circ, 0.0^\circ, 0.5^\circ, 1.0^\circ, 1.5^\circ, 2.0^\circ, 2.5^\circ, 3.0^\circ]$
- Encourage use of committee-supplied grids; user-generated grids are acceptable



<https://www.aiaa-dpw.org/Workshop3/presentations/S9-Zickhur-Case2-Summary.pdf>

- Reference Units

Sref (semi-span grid)	Cref	Semispan	Moment Center
225.0 sq.in	7.7778 in	30.0 in	(6.0726, 0.0, 0.0)

- Conditions

Mach	Re _c	α	T _{static} (120.33° F)	γ	Pr	Pr _t	Farfield $\chi = \tilde{v}/v$
0.76	5×10^6		580.0 R 322.22 K	1.4	0.72	0.90	3

- Sutherland's Law

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

$T_0 = 491.6^\circ R \quad S = 198.6^\circ R$