

Influence of inflow turbulence intensity on static and dynamic stall of NACA 0021 at $Re = 5.5 \times 10^6$ using DDES method

The comparisons of spanwise extent, URANS and DDES, and inflow turbulence are useful for understanding high-Reynolds-number stall. I recommend **major revision**. The principal concern is whether the reported stall delay represents a response to physical freestream turbulence or to prescribed turbulence-model inputs. The mechanism discussion and the accuracy of the unsteady predictions also need closer support.

1. **Inflow specification and interpretation.** Section 2.2 does not adequately define the controlling parameter. Give the inlet k and ω , the length scale or viscosity ratio used to set them, and what is held fixed as TI varies. Define the “apparent TI”, including probe location, reference velocity and averaging, and report its decay from the inlet. Distinguish intensity inferred from modelled k from that calculated from resolved velocity fluctuations.

No fluctuating inflow prescription is described. An LES-mode region in Fig. 9d does not establish the presence of incoming turbulent eddies. If only mean turbulence quantities are imposed, qualify the physical interpretation of the TI trend. Support the proposed enhancement of boundary-layer mixing with eddy-viscosity and wall-shear or separation data at representative turbulence levels; otherwise retain it as a hypothesis.

2. **Interpretation of the URANS–DDES comparison.** The larger k in URANS in Fig. 9c does not establish an overprediction of total turbulent kinetic energy if the plotted variable excludes the resolved contribution in DDES. Identify the quantity and compare consistently defined statistics, or limit the discussion to modelled k . Likewise, instantaneous streamlines do not establish that increased effective incidence causes the abrupt stall. Quantify this incidence if the explanation is retained as a causal mechanism. Provide the DDES filter-width settings explicitly; “maxDeltaxyzCoeffs is set to 2” is insufficient.

3. **Numerical sensitivity.** Both spans use 25 cells, so increasing the span from $0.25c$ to $2.5c$ also increases Δz tenfold. The load changes cannot be attributed solely to domain length. Limit the aspect-ratio conclusion to the tested configurations unless spanwise resolution and domain-length effects are separated.

Appendix A reports a GCI of 0.01% for URANS and a still smaller value for DDES, despite oscillatory convergence. Supply the force values, refinement ratios and observed-order calculation, and justify the extrapolation for a hybrid method whose modelled–resolved partition changes with the grid. Use the existing mesh results to assess mean loads, fluctuation amplitudes and dominant frequencies separately. For quantitative spectral claims, include a representative time-step check. Report measured computational cost and restrict the comparison to the accuracy demonstrated; negligible overhead on a common mesh is not an equal-accuracy comparison.

4. **Stall onset and sampling uncertainty.** Define the stall-onset criterion and angular spacing, and state how the static cases are initialised. The 10 s averaging interval contains about 20 shedding periods at $f^* \simeq 0.1$; check the sensitivity of near-stall mean loads to the averaging interval. Distinguish temporal fluctuations and spanwise variation from uncertainty in the mean. With five TI levels, the change near 4% should be described as a trend between sampled cases, not an established threshold.

5. **Experimental comparison.** The best-matching apparent TI of 3.6% and the upstream tunnel TI of 0.3–1.1% have different sampling locations and potentially different definitions. Discuss this mismatch before treating agreement in stall onset as validation of the TI dependence. The acknowledged uncertainty in tunnel corrections and the comparison of experimental midspan loads with numerical span-integrated loads should also qualify the accuracy claims. For the pitching cases, give the pivot, motion law and initialisation, and clarify how the angle correction affects reduced pitch rate and time normalisation.
6. **Spectral analysis.** Specify the resampling rate and interpolation, moving-average window, Fourier window and duration, and spectral normalisation. Check the sensitivity of the transient peak near $f^* \simeq 0.5$ to these choices. Its disappearance indicates decay of a load component, not necessarily complete dissipation of a distinct vortex. Relate the vortex interpretation to flow-field evolution or use the more limited description. Figure 10 also needs correction: the ordinate is labelled dB/Hz but shows positive powers of ten. Define the spectral units consistently with the nondimensional frequency.

Minor comments

- Restrict the fully turbulent assumption to the airfoil and conditions examined in Appendix B. Reynolds number alone does not establish it.
- Identify the transition treatment in the URANS pitching cases and the forced-transition locations in XFOIL.
- Define the reference length for each Strouhal number. Avoid calling the finite-span $0.25c$ domain two-dimensional.
- Correct the language and reference errors, including “the results are nearly different”, “tailing-edge stall”, the missing chord-length unit and duplicated DOI prefixes. Sharing the force histories and spectral-processing script would aid reproducibility.