CORRECTION: Velocity Scaling of Shear Layer Noise induced by cold Jet flow with co-flowing Flight stream

Author(s) Name: Christian Jente*, Jan W. Delfs†

Author(s) Affiliations: German Aerospace Center (DLR), Lilienthalplatz 7, D-38108 Braunschweig, Germany

1. Correction of trapezoid approximation (page 7, equation 16) This formula describes an approximative non-dimensional positioning of the shear layer centroid and not the convection parameter. This formula needs to be renamed as $r_{id}(r_U)$ instead of $c_{id}(r_U)$:

$$r_{id}(r_U) := \frac{R_c}{\delta_\omega} = \frac{2}{3} \cdot \frac{1 - r_U}{1 + r_U} + \frac{r_U}{1 + r_U}$$

The correct convection velocity parameter $c_{id}(r_U)$ which matches the approximation is then calculated as

$$c_{id}(r_U) := \frac{U_c}{\Sigma U} = r_{id} + (1 - 2 \cdot r_{id}) \cdot \frac{r_U}{1 + r_U}$$

This change affects the trapezoid approximation (blue line) of figure 6 (p. 8), which shows a similar (possibly more physical) curvature as the centroid parameter for the simplified mean pressure function:

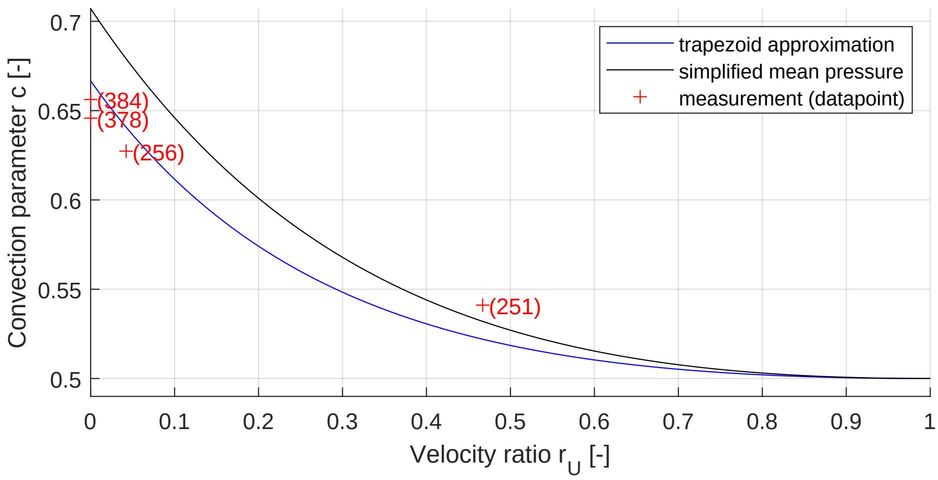

Figure 1: Approximation for the convection parameter and experimental data

Moreover, the transition between shear layer and propagation dominated flow might be expected around $r_U = 0.29 \ldots 0.33$ (p. 10, eqn. 47 and 48 as well as 3^{rd} paragraph). Equation 47 should read:

$$U_\infty \approx 0.29 \cdot U_{jet}$$

This guess for the transition is also mentioned on p. 22 (figure 20, enumerations 2 and 3 as well as the 3^{rd} bullet point of the conclusion). The miscalculated lower limit for the transitional range of $r_U = 0.25$ is not completely wrong: Wrt. the experimental results, it is also a suitable transitional value between strong and weak normal velocity profiles.

Since rather similar velocity ratios are used, there are not any significant changes in the plots used for the velocity scaling (of figures 7 to 18).

*Research Engineer, Department of Technical Acoustics, christian.jente@dlr.de
†Head of Department, Technical Acoustics

2. CLARIFICATION The used approximation for the convection parameter c_{id} suggest indirectly, that there is no velocity difference in a top hat (or unity) velocity profile ($r_U = 1$). This is an idealization which can be made for the low velocity ratio data used within this paper, but may not suit well for higher velocity ratios ($r_U \to 1$). Real effects, such as nozzle boundary layers and trailing edge thickness may cause a more wake-like velocity profile. The convection parameters for near-unity velocity profiles may be therefore smaller than 0.5: $c(r = 1) \leq 0.5$.

3. CORRECTION OF STROUHAL NUMBER The Strouhal number relation which is defined by convection speed (p. 10, equation 32) was incorrectly described. The correct formulation is:

$$Sr \propto \frac{f \cdot D_{mix}}{U_c} \cdot \frac{(1 - r_U)}{c \cdot (1 + r_U)}$$

4. CORRECTION OF POTENTIAL CORE SCALING EXPLANATION In the last paragraph on p.11, it is suggested that Michalke and Michel's correlation allows to conclude that the high frequency part of the spectra collapses at $q = 6$. This conclusion cannot be made wrt. Michalke and Michel. Their correlation suggests a scaling proportional to $I \propto U_{jet}^2 \cdot \Delta U^6$.