

Correction of multihole pressure probe measurements in velocity gradients

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Multihole pressure probes are widely used as accurate, robust, and versatile flow-measuring instruments with numerous advantages over other flow measuring devices. Surprising though that a very few experimentalists, which use the multihole pressure probes in strong gradient fields, apply the spatial resolution and downwash velocity corrections.

In recent experiments performed at Chalmers¹ extensive measurements were performed using both the five-hole probes and cross hot-wires. During data analysis it was found that the crossflow velocity components measured by the five-hole pressure probes disagreed with those obtained using the cross hot-wires. Differences between these two measurement data sets were observed in zones of vane wakes and sidewall boundary layers where the velocity gradients are strong. Our subsequent research has revealed that a modified version of correction by Ligrani et al.² can be used to compensate for the 5-hole probe errors caused by the velocity gradients.

The results on the implementation and verification of the correction will be presented. The efficiency of the obtained correction is scrutinized through detailed side-by-side comparison with corresponding cross hotwire data. To our knowledge, such verification was not performed previously. This study demonstrates a very good efficiency and reliability of the correction, which lead to a significant improvement of the corrected velocity data. A very important fact is that the described correction is not found to over-correct and distort the data and can be used safely.

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¹ Hjärne et al., *ASME paper* GT2007-27712 (2007).

² Ligrani et al., *Exp. Fluids*, **7**, 424 (1989).

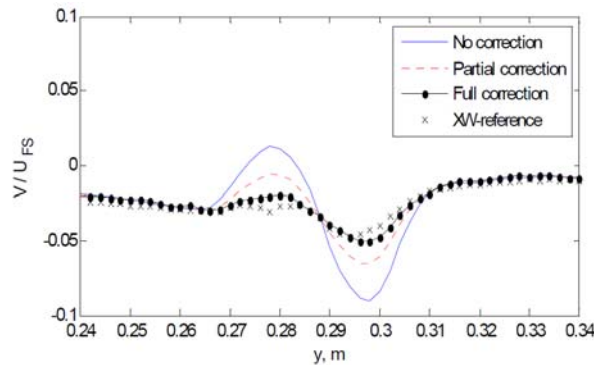


Figure 1: Effect of different parts of correction. Profiles of vertical velocity at $x = 0.5C$ and $z = -0.036$ m. Partial correction denotes correction for spatial resolution without downwash correction.