

Recent development in time-resolved three-dimensional velocity measurements in turbulent flows by high-speed tomographic particle image velocimetry

Fulvio Scarano

Aerospace Engineering Department - Aerodynamics
Delft University of Technology, The Netherlands

Abstract The talk will first introduce the fundamental aspects of three-dimensional velocity measurements by the tomographic PIV principle, with details on achievable measurement volume, measurement accuracy, spatial resolution and system complexity. The application of time-resolved Tomo-PIV to the study of turbulent shear flows will be illustrated by experiments conducted in air flows and at higher resolution in water flows. Extensive visualizations of free and impinging jets from circular, chevron and swirled exits will be discussed, with focus on the dynamical behavior of large-scale coherent flow structures and their role in the production of acoustic noise. Finally, the talk will close with a discussion of the potential application of time-resolved tomographic PIV as a complementary tool for the study of turbulent combustion.

Biographical Prof. Scarano received the Aerospace Engineering degree at the University of Naples (cum laude, 1996). The Ph.D. degree was obtained in 2000 for the research conducted at the von Karman Institute where he also received the Theodor von Karman prize. Immediately after he moved to the Aerodynamics Section of the Aerospace Engineering Department at TU Delft. Since 2010 he is head of the Aerodynamics section and director of the Graduate School of Aerospace Engineering at TU Delft. He received a European Research Council grant (2009) and the Dutch Science Foundation innovation grant (2005). Since 2010 he coordinates the international consortium AFDAR (Advanced Flow Diagnostics for Aeronautical Research).



Research profile The research interests cover fundamental aspects of PIV with focus on advanced interrogation techniques, applications to high-speed aerodynamics and the use of PIV in aero-acoustics. Fundamental contributions to PIV include studies on the image deformation approach, adaptive interrogation and the introduction of the Tomographic PIV technique. He has also contributed to the extension of PIV to the supersonic and hypersonic flow regimes. He received the European Space Agency 2011 award in aerothermodynamics for the first time-resolved PIV experiments on ARIANE V in the transonic buffeting regime.