

# Modelling Hydrodynamic Drag in Swimming using Computational Fluid Dynamics

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## 1. Introduction

In the sports field, numerical simulation techniques have been shown to provide useful information about performance and to play an important role as a complementary tool to physical experiments. Indeed, this methodology has produced significant improvements in equipment design and technique prescription in different sports (Kellar et al., 1999; Pallis et al., 2000; Dabnichki & Avital, 2006). In swimming, this methodology has been applied in order to better understand swimming performance. Thus, the numerical techniques have been addressed to study the propulsive forces generated by the propelling segments (Rouboa et al., 2006; Marinho et al., 2009a) and the hydrodynamic drag forces resisting forward motion (Silva et al., 2008; Marinho et al., 2009b).

Although the swimmer's performance is dependent on both drag and propulsive forces, within this chapter the focus is only on the analysis of the hydrodynamic drag. Therefore, this chapter covers topics in swimming drag simulation from a computational fluid dynamics (CFD) perspective. This perspective means emphasis on the fluid mechanics and