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A Comparative Analysis of Swimming Styles in Competitive Swimming ALFRED VON LOEBBECKE, RAJAT MITTAL, George Washington University, VARUN GUPTA, James Madison High School, RUSSELL MARK, USA Swimming — High-fidelity numerical simulations are being used to conduct a critical evaluation of swimming strokes in competitive swimming. We combine computational fluid dynamics (CFD), laser body scans, animation software, and video footage to develop accurate models of Olympic level swimmers and use these to examine contrasting styles of the dolphin kick as well as the arm strokes in back and front crawl stroke. In the dolphin kick, the focus is on examining the effects of Strouhal number, kick amplitude, frequency, and technique on thrust production. In the back stroke, we examine the performance of the so called “flat stroke” versus the “deep catch,” The most important aspect that separates the two major types of back stroke is the alignment or angle of attack of the palm during the stroke. In one style of front crawl arm stroke, there is greater elbow joint flexion, shoulder abduction and sculling whereas the other style consists of a straight arm pull dominated by simple shoulder flexion. Underlying the use of these two styles is the larger and more fundamental issue of the role of lift versus drag in thrust production and we use the current simulations to examine this issue in detail.

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