EXPERIMENTAL DETERMINATION OF DRAG CONSTANT FOR SLOW MOVING AXISYMMETRIC BODIES

Utsav Bhardwaj
Department of Mechanical Engineering
Deenbandhu Chhotu Ram University of Science and
Technology, Murthal
Sonepat-131 039, Haryana, India
Email : utsavbhardwaj50@gmail.com

Tejinder Kumar Jindal
Professor
Department of Aerospace Engineering
Punjab Engineering College
Chandigarh-160 012, India
Email : tkjindal@pec.ac.in

Suresh Verma
Professor
Department of Mechanical Engineering
Deenbandhu Chhotu Ram University of Science and Technology, Murthal
Sonepat-131 039, Haryana, India
Email : skverma.me@dcrustm.org

Abstract

A body moving through a fluid experiences drag, which primarily consists of two components: form drag and viscous drag. At high velocities, the form drag predominates whereas at low velocities, the viscous drag predominates. The form drag is characterized by the drag coefficient which is determined experimentally for various configurations. Similarly, the viscous drag is characterized by the drag constant which in turn is known only for specific cases and its generic governing model is not well established yet. The current study puts forward a generalized mathematical model for determination of the drag constant for frontally streamlined small axisymmetric bodies moving slowly through a fully-enclosing fluid at zero angle of attack. It has been accomplished by establishing a governing mathematical model for viscous drag, validating it via wind tunnel experiments and then comparing it with the standard linear drag equation. Conclusively, the drag constant has been determined in terms of the fluid properties and dimensions of the moving body. This paper describes the above-mentioned mathematical model followed by the process of its experimental validation and determination of drag constant.

Keywords: Viscous Drag, Form Drag, Linear Drag Equation, Drag Constant, Wind Tunnel Experiments