Introduction to Lift

The sections that follow present some of the features associated with the lift produced by the flow around a finite object, the lift being the force on the object normal to the oncoming stream. We focus on high Reynolds number flows, $Re >> 1$; flows with $Re << 1$ are treated in section (Df) on animal locomotion. We also focus almost exclusively on flows in which the impinging stream is uniform and usually steady though unsteady flows are treated elsewhere in this book. We begin in the next three sections with a description of the Magnus effect, followed by a more general description of the relation between circulation and lift. This leads naturally into a description of the effects of rotation on the trajectory of a object in flight.

In practical aerodynamics or hydrodynamics one is most often concerned with the detailed performance of an object shaped like an airfoil and this is examined by first describing the performance of a flat plate airfoil and then more general airfoil shapes in planar or two-dimensional flow before addressing the additional complications associated with finite span foils. We end this set of sections with a brief treatment of aircraft flight.