

Introduction to Unsteady Flows

Unsteady fluid flows have already been addressed in many sections of this book. For example sections (Bn) addressed ways to analyze one-dimensional internal flows and sections (Bgc), (Bpb) and (Bpf) dealt with several aspects of waves in oceans, rivers, storage tanks, etc. Some of the exact solutions to the Navier-Stokes equations addressed unsteady flows, for example sections (Bid) and (Bif). Sections (Bkc), (Bkd) and (Bke) examined boundary layer stability leading discussions of turbulent flows in sections (Bkf) to (Bkk) - and sections (Boh) and (Bom) dealt with shock waves.

However, this brief review of basic fluid dynamics would not be complete without some discussion of other unsteady flow phenomena and analyses. In the next section we address the issue of the *added mass* properties that manifest themselves in unsteady flows. When a body is accelerated in a fluid, in addition to the force connected with the acceleration of the body, there is a force necessary to accelerate the mass of fluid that is accelerated along with the body. That mass is called the *added mass* and the next section is devoted to data and analyses of that added mass.

The following section addresses another important unsteady fluid flow phenomenon, namely the process of vortex shedding in flows in a particular range of Reynolds numbers. One of the important consequences is the resulting forces to which the object that is shedding the vortices is subjected. Some massive structures have been destroyed by those forces.