A Brief Note on Turbulent flow

Usha Shukla*, Suraj Sharma

Department of Applied Sciences, Amity University Uttar Pradesh, Uttar Pradesh, Luck now, India

Commentary

Received: 27-Jul-2022 Manuscript No. JPAP-22-56787; **Editor assigned:** 29-Jul-2022 Pre QC No. JPAP-22-56787(PQ); **Reviewed:** 12-Aug -2022, QC No. JPAP-22-56787; **Accepted:** 19-Aug-2022, Manuscript No. JPAP-22-56787(A) **Published:** 26-Aug-2022, DOI:10.4172/2320-2459.10.S3.005.

***For Correspondence:**

Usha Shukla, Department of Applied Sciences, Amity University Uttar Pradesh, Uttar Pradesh, Luck now, India

E-mail: usha.shukla1@gmail.com

DESCRIPTION

In fluid dynamics, turbulence or turbulent flow is fluid motion characterized by chaotic changes in pressure and flow velocity. It is in contrast to a laminar flow, which occurs when a fluid flows in parallel layers, with no disruption between those layers. Turbulence is commonly observed in everyday phenomena such as surf, fast flowing rivers, billowing storm clouds, or smoke from a chimney, and most fluid flows occurring in nature or created in engineering applications are turbulent. Turbulence is caused by excessive kinetic energy in parts of a fluid flow, which overcomes the damping effect of the fluid's viscosity. For this reason turbulence is commonly realized in low viscosity fluids. In general terms, in turbulent flow, unsteady vortices appear of many sizes which interact with each other, consequently drag due to friction effects increases. This increases the energy needed to pump fluid through a pipe.

The onset of turbulence can be predicted by the dimensionless Reynolds number, the ratio of kinetic energy to viscous damping in a fluid flow. However, turbulence has long resisted detailed physical analysis, and the interactions within turbulence create a very complex phenomenon. Richard Feynman described turbulence as the most important unsolved problem in classical physics. Smoke rising from a cigarette. For the first few centimeters, the smoke is laminar. The smoke plume becomes turbulent as its Reynolds number increases with increases in flow velocity and characteristic length scale.

Flow over a golf ball. (This can be best understood by considering the golf ball to be stationary, with air flowing over it.) If the golf ball were smooth, the boundary layer flow over the front of the sphere would be laminar at typical conditions. However, the boundary layer would separate early, as the pressure gradient switched from favorable (pressure decreasing in the flow direction) to unfavorable (pressure increasing in the flow direction), creating a large region of low pressure behind the ball that creates high form drag. To prevent this, the surface is dimpled to perturb the boundary layer and promote turbulence. This results in higher skin friction, but it moves the point of boundary layer separation further along, resulting in lower drag.

In the medical field of cardiology, a stethoscope is used to detect heart sounds and bruits, which are due to turbulent blood flow. In normal individuals, heart sounds are a product of turbulent flow as heart valves close. However, in some conditions turbulent flow can be audible due to other reasons, some of them pathological. For example, in advanced atherosclerosis, bruits (and therefore turbulent flow) can be heard in some vessels that have been narrowed by the disease process. Recently, turbulence in porous media became a highly debated subject.

Strategies used by animals for olfactory navigation, and their success, are heavily influenced by turbulence affecting the odor plume. Clear-air turbulence experienced during airplane flight, as well as poor astronomical seeing (the blurring of images seen through the atmosphere).

Turbulent flows are always highly irregular. For this reason, turbulence problems are normally treated statistically rather than deterministically. Turbulent flow is chaotic. However, not all chaotic flows are turbulent. The readily available supply of energy in turbulent flows tends to accelerate the homogenization (mixing) of fluid mixtures. The characteristic which is responsible for the enhanced mixing and increased rates of mass, momentum and energy transports in a flow is called "diffusivity’’

Turbulent diffusion is usually described by a turbulent diffusion coefficient. This turbulent diffusion coefficient is defined in a phenomenological sense, by analogy with the molecular diffusivities, but it does not have a true physical meaning, being dependent on the flow conditions, and not a property of the fluid itself. In addition, the turbulent diffusivity concept assumes a constitutive relation between a turbulent flux and the gradient of a mean variable similar to the relation between fluxes and gradient that exists for molecular transport.