

FLUID MECHANICS

Fluid Mechanics is that branch of science which deals with behaviour of the fluids at rest as well as in motion

Fluid mechanics can we divided into 3 divisions:

- ❖ Hydrostatics: that studies the mechanics of fluids at absolute and relative rest.
- ❖ Kinematics: deals with translation, rotation and deformation of fluid without considering the force and energy causing such a motion.
- ❖ Dynamics: that prescribes the relation between velocities and acceleration and the forces which are exerted by or upon the moving fluids.

What is Fluid ?

Matter exist in two principal forms:

- Solid
- Fluids

Fluids are further sub-divided into:

- Liquid
- Gas



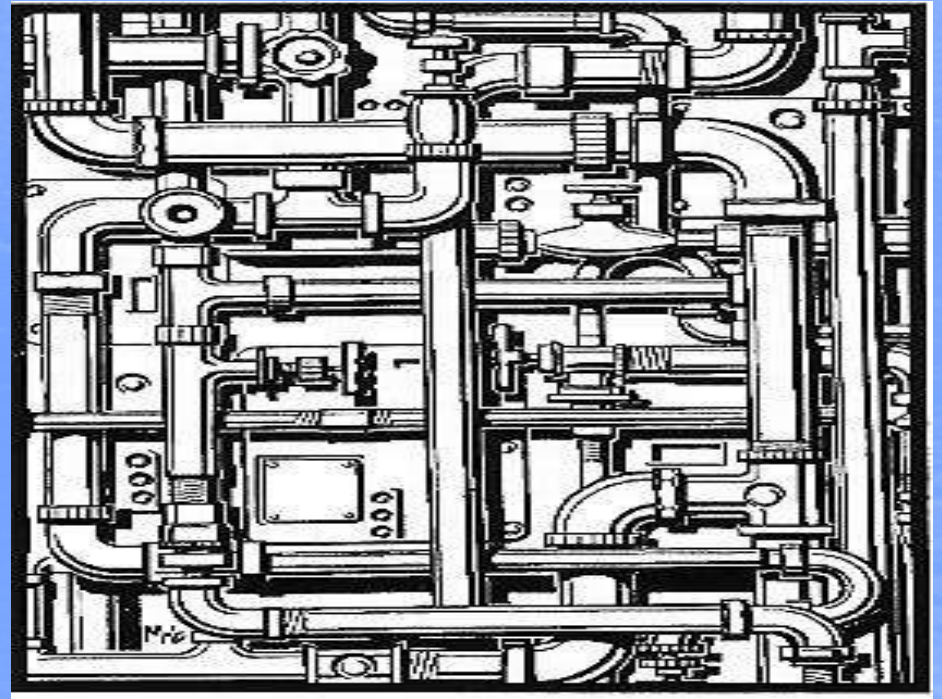
A DAY FULL OF FLUID MECHANICS

YOU WOKE UP IN THE MORNING AND THE ROOM IS COOL.

Coolant circulating
Inside it and cool
Air which it gives
is Fluid



After that you washed your face at the sink. The water which comes at your tap is fluid and has come through the piping system which also comes under fluid mechanics.



After that you decided to have your breakfast. The coolant moving inside the small pipes at the back of your refrigerator, and the air circulating inside it are both fluids.

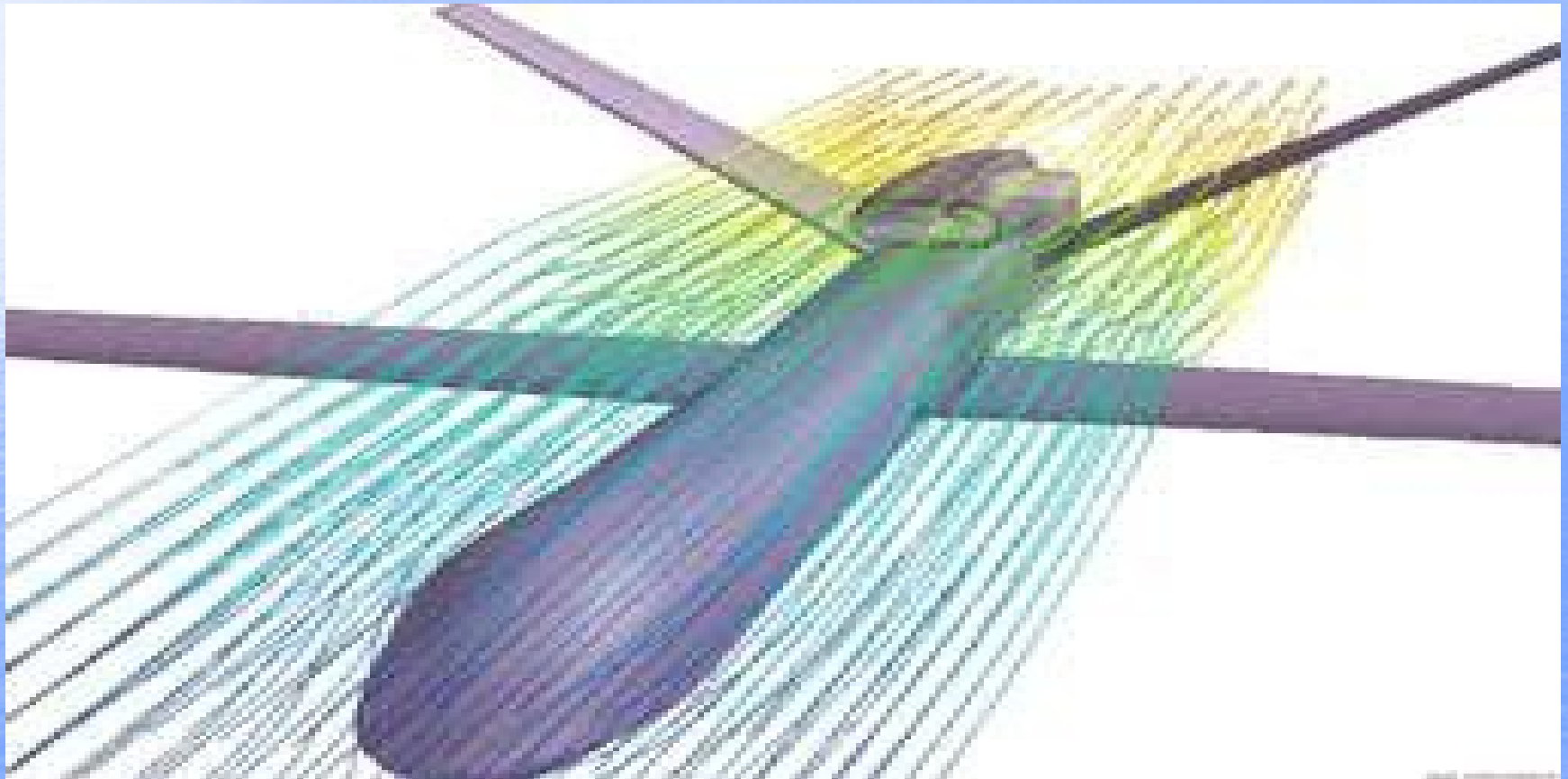
After finishing your breakfast, You decided to do some cleaning before heading to the school. Proper suction of air and filtering the dust requires the knowledge of Fluid Mechanics.



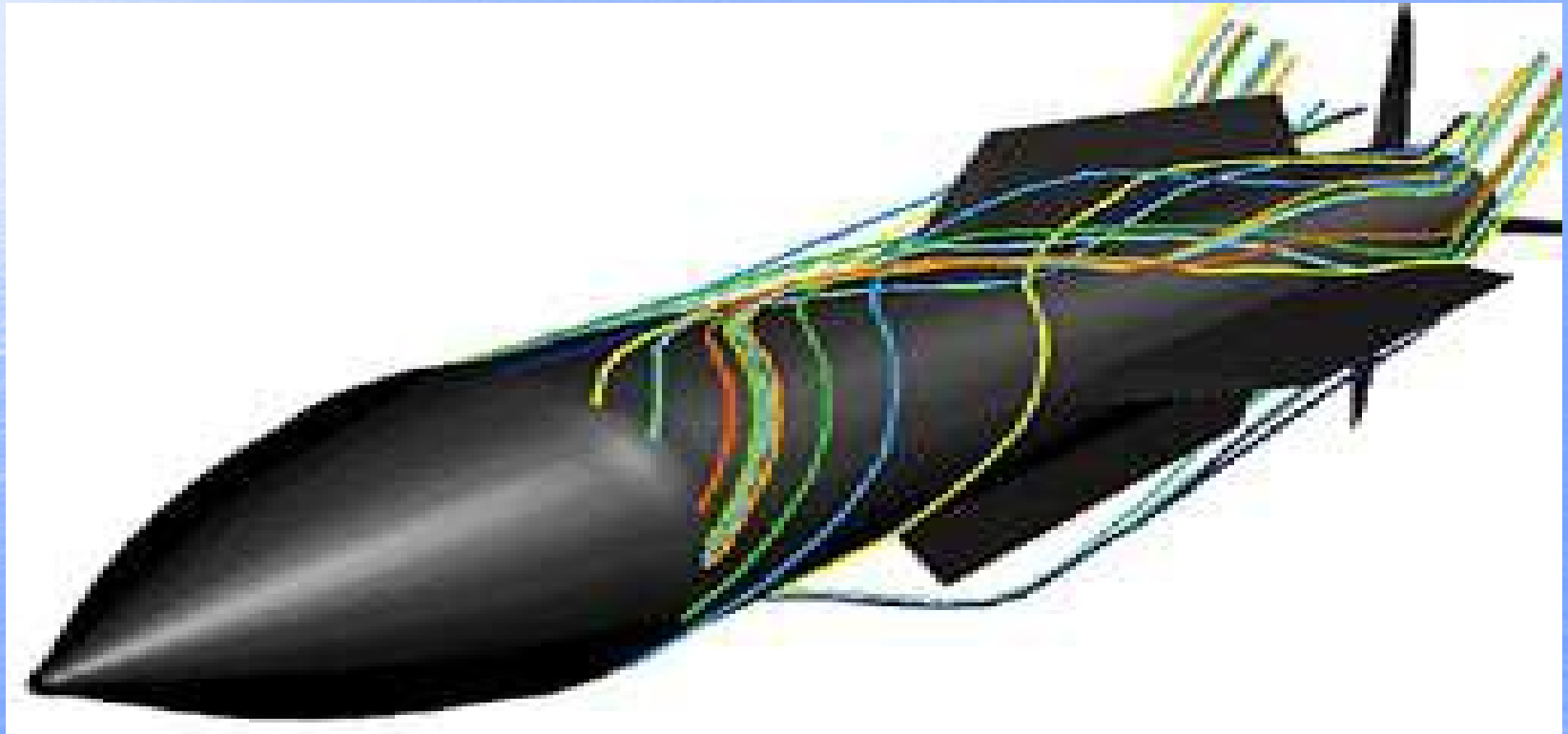
After that you turned on your T.V
to get the morning news.
Nothing good, war again



UNMANNED AIR VEHICLE USED BY US ARMY IN AFGHANISTAN



MISSILE AERODYNAMICS



Now it's the time to go to college,
otherwise you will get late

A mixture of fuel like petrol and air is forced
by atmospheric (or greater) pressure into
the cylinder through the intake port



Before your class you went to PC lab and took a print out of your assignment. Inkjet printing also involves fluid mechanics.



Knowledge of Fluid Mechanics is essential for proper design of Ships.



Otherwise without the proper knowledge of fluid mechanics,
What will happen



Significance of Fluid Mechanics

- Design of wide range of hydraulic structures (dams, canals) and machinery (pumps, turbines).
- Fluidic control devices; both pneumatic and hydraulic.
- Design and analysis of gas turbine, rocket engine, super sonic aircrafts.
- Human circulatory system i.e the flow of blood in veins and the pumping action of heart.

Hydrostatic law

- The intensity of pressure increases as we move in vertical downward direction
- $P = \rho gh$

Application

- Dams are one good example
- Another is the flush valve. It is mounted at the bottom of the tank. As the tank fills the fluid pressure at the bottom increases, in accordance with the hydrostatic law. This valve senses that pressure and cuts off the flow when the pressure reaches some pre-set value. Thus it controls the level of water in the tank without a float. And it works very well

Pascals law

- $P_x = P_y = P_z$

Application of pascals law

- Hydraulic press
- Hydraulic brakes
- car lifts,
- hydraulic jacks,
- forklifts all make use of this principle.

