

1 Chinmayee - ME20B053

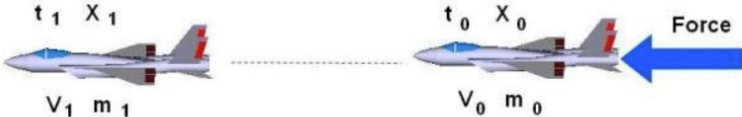
1.1 Newton's Second Law

[?]

$$F = ma(= \text{change in momentum}) \quad (1)$$

F = Force acting on the body
 m = Mass of the body
 a = Acceleration of the body

Newton's second law states that the acceleration of an object is directly related to the net force and inversely related to its mass. Acceleration of an object depends on two things, force and mass. It allows you to calculate the acceleration (and therefore velocity and position) of an object with known forces. The force acting on a body is equal to the change in momentum of the body per unit time, which in turn gives us " $F=ma$ ".



The diagram illustrates the concept of force as the rate of change of momentum. It shows a jet engine at two different times, t_0 and t_1 , with corresponding positions X_0 and X_1 , velocities V_0 and V_1 , and masses m_0 and m_1 . A blue arrow labeled "Force" points to the left, indicating the direction of the net force acting on the engine.

Force = Change of Momentum with Change of Time

Difference form:
$$F = \frac{m_1 V_1 - m_0 V_0}{t_1 - t_0}$$

With constant mass:
$$F = m \frac{V_1 - V_0}{t_1 - t_0}$$

Legend:
 t = time
 X = location
 m = mass
 V = Velocity

$F = m a$
Force = mass x acceleration

Figure 1: ME20B053

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