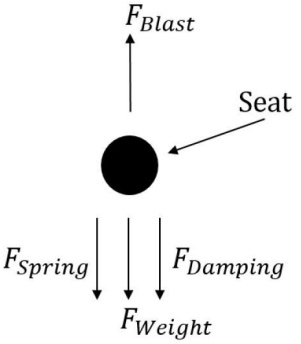
The Scenario

Simplify

The Scenario Simplified

Model

The Free Body Diagram



$$mx'' = \sum Forces$$

Variables and Parameters

$x \equiv Verticle\ displacement\ of\ the\ seat\ [cm]$
$t \equiv Time\ [ms]$
$m \equiv Mass\ [kg]$
$g \equiv Gravity\ [m/s^2]$
$\gamma \equiv Damping\ Constant\ [kg/ms]$
$k \equiv Spring\ Constant\ [kg/ms^2]$
$T \equiv Time\ of\ the\ Blast\ [ms]$

$$u_T = \begin{cases} 1, & t \geq T \\ 0, & t < T \end{cases}$$

The Model

$$mx'' = F_{Blast} - F_{Spring} - F_{Weight} - F_{Damping}$$

$$mx'' = F_{Blast} - k(x + L) - mg - \gamma x'$$

$$mx'' + \gamma x' + kx = F_{Blast}$$

$$mx'' + \gamma x' + kx = 100(u_T - u_{T+20}), x(0) = 0, x'(0) = 0$$