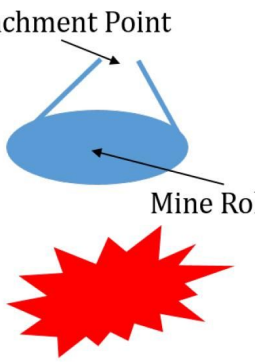
The Scenario

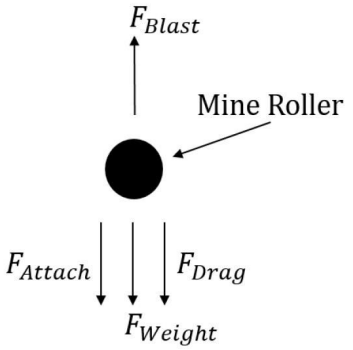
The Scenario Simplified

Simplify



Model

The Free Body Diagram



$$mx'' = \sum Forces$$

Variables and Parameters

$x \equiv Verticle\ displacement\ of\ the\ roller$
$t \equiv Time$
$m \equiv Mass$
$g \equiv Gravity$
$\gamma \equiv Damping\ Constant$
$T \equiv Estimate\ for\ the\ Time\ the\ Roller\ Breaks\ From\ its\ Mount$

The Model

$$mx'' = F_{Blast} - F_{Attachment} - F_{Weight} - F_{Drag}$$

3 Versions of a Model:

$$mx'' = Ae^{-bt} - Ce^{-dt} - mg - \gamma x'$$

Or

$$mx'' = Ae^{-bt} - C - mg - \gamma x', \qquad t < T$$
$$mx'' = Ae^{-bt} - mg - \gamma x', \qquad t \geq T$$

Or

$$mx'' = -Ce^{-dt} - mg - \gamma x', \qquad x'(0) from\ the\ blast$$