Basic Kinematics in Passenger Vehicle Accidents

David Elliott
St Peter’s Hospital Chertsey
Newtons 2nd law of motion

\[ F = ma \]

(Don’t drive into trees)
Acceleration = \frac{\text{change in velocity}}{\text{time}}
Newtons 3rd law of motion

Every action has an equal but opposite reaction

Conservation of momentum

(Don’t drive into trees)
Conservation of momentum

\[ \text{Momentum} = \text{mass} \times \text{velocity} \]

Velocity has a vector
20 m/sec + 10 m/sec = 5 m/sec
Packaging Theory

• The package should not open up and spill its contents and should not collapse under expected conditions of force and thereby expose objects inside it to damage
Packaging Theory

• The packaging structures which shield the cargo must not be made of brittle or frail materials; they should resist force by yielding and absorbing energy applied to the outer container so as to cushion and distribute impact forces and thereby protect the cargo.
Packaging Theory

• Articles contained in the package should be held and immobilised inside the outer structure by interior packaging which should prevent movement and resultant damage from impact against the inside of the package itself
Packaging Theory

- The means for securing an object inside a shipping container must transmit the forces applied to the container to the strongest parts of the contained objects.
Source: CCIS study 1983-1992

- Age=16-29 (n=17)
- Age=30-59 (n=35)
- Age=60+ (n=16)
Future for internal packaging

- Sensing crash severity
- Variable restraint characteristics
- Variable seating positions
- Variable airbag firing threshold
- Variable airbag characteristics
- Respond to crash configuration