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Empowering Communities...*

OCCUPANT KINEMATICS



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INTRODUCTION

OCCUPANT - KINEMATIC

An "occupant" is a person or an animal that is inside a particular space, such as a room, a vehicle, or a building. For example, the occupants of a car are the people or pets who are inside it, and the occupants of a house are the people who live or stay inside it.

The study of motion, without considering the forces that cause that motion. In other words, kinematics is concerned with describing how objects move, without worrying about what is making them move. Kinematics often involves analyzing the position, velocity, and acceleration of objects over time.

INTRODUCTION

OCCUPANT - KINEMATIC

Occupant kinematic:- "Occupant kinematics" refers to the study of how occupants of a vehicle move during a crash.

- This includes analyzing the motion of different body parts and the overall movement of the body during a collision or sudden stop.
- The study of occupant kinematics is important for understanding how different safety features in a vehicle, such as seat belts and airbags, can protect occupants from injury.
- By understanding how occupants move during a crash, engineers can design and test safety systems to make them more effective in reducing the risk of injury.

IMPORTANCE



- Forensic investigators use occupant kinematics to analyze the movements of vehicle occupants during a collision.
- Occupant kinematics can provide critical information about the cause and severity of injuries sustained by vehicle occupants in an accident.
- The analysis of occupant kinematics can help determine whether the use of safety features such as seat belts and airbags could have prevented or mitigated injuries.
- By analyzing the vehicle's damage and the injuries of occupants, forensic investigators can determine the direction and force of the impact, which can help identify who was at fault in the accident.

IMPORTANCE

- Forensic investigators can use the principles of occupant kinematics to recreate the accident scene and determine the speeds of the vehicles involved in the collision.
- Occupant kinematics can be used to assess the effectiveness of safety measures and identify areas for improvement in vehicle design.
- Forensic investigators can use occupant kinematics to determine the position of vehicle occupants at the time of the accident, which can help identify how the accident occurred and who was responsible.
- Occupant kinematics can provide valuable information in civil and criminal cases related to vehicle accidents, helping to establish liability and determine appropriate compensation for victims.



CASE STUDY

The Ford Pinto- 1973

- The Ford Pinto's fuel tank was located behind the rear axle, which increased the risk of the fuel tank rupturing and catching fire in rear-end collisions.
- The design flaw resulted in a phenomenon called "fuel-fed fires," where the fuel tank ruptured upon impact, and the gasoline ignited, causing the car to burst into flames.
- The fuel-fed fires were especially dangerous for the occupants of the Pinto because the car's body structure was weak and did not provide adequate protection.
- The weak body structure of the Pinto caused the occupants to be thrown forward and impact the dashboard or windshield, resulting in serious injuries or fatalities.

FRONT DOORS JA SHUT
.... PREVENTING ESCAPE OR RESCUE
FROM BURNING CAR

FILLER TUBE
PULLS OUT OF
FUEL TANK

"EXPOSED"
FUEL TANK
VULNERABLE TO
DIRECT IMPACT,
CRUSHING,
AND PUNCTURING
IN REAR-END COLLISIONS

SEPARATION OF
VEHICLE FLOOR PAN AT
WHEEL WELLS ALLOWS
FIRE ENTRY INTO THE
PASSENGER COMPARTMENT

FUEL TANK
TOO CLOSE TO
REAR PERIMETER
OF VEHICLE

"HOSTILE
ENVIRONMENT"
SHOCK ABSORBER
BRACKET

INNER EDGE OF
SUBFRAME MEMBER

REAR LEAF SPRING
SHACKLE PLATE
AND BRACKET

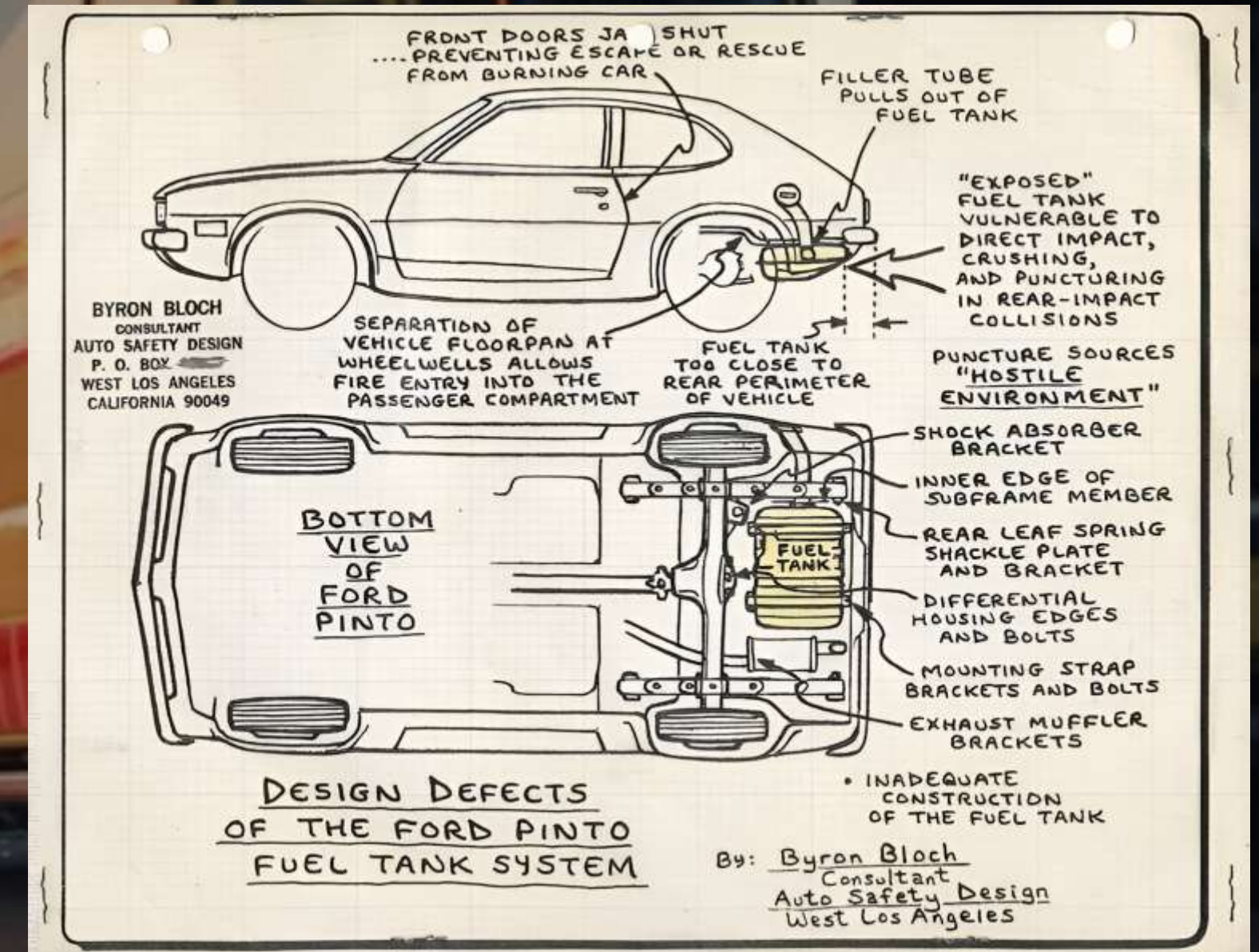
DIFFERENTIAL
HOUSING EDGES
AND BOLTS

MOUNTING STRAP
BRACKETS AND BOLTS

BYRON BLOCH
CONSULTANT
AUTO SAFETY DESIGN
P. O. BOX 1000
WEST LOS ANGELES
CALIFORNIA 90049

BOTTOM
VIEW
OF
FORD
PINTO

CASE STUDY



- The Ford Pinto case highlighted the importance of considering occupant kinematics in designing safe vehicles and the need for companies to prioritize safety over cost-cutting measures.

CHALLENGES



- Occupant kinematics can be difficult to analyze due to the complexity of human anatomy and the variability of injuries sustained in accidents.
- Vehicle occupants may move in unpredictable ways during a collision, making it challenging to determine their exact movements and the forces they experienced.
- It may be difficult to determine the position of vehicle occupants at the time of the accident due to the chaotic nature of collisions and the potential for multiple impacts.
- Factors such as seat belt usage, airbag deployment, and the positioning of the seats can all affect occupant kinematics, making it difficult to compare different accidents and draw meaningful conclusions.