



# **SNS COLLEGE OF TECHNOLOGY**

**Coimbatore-35**  
**An Autonomous Institution**

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Approved by AICTE, New Delhi & Affiliated to Anna University, Chennai



## **DEPARTMENT OF AUTOMOBILE ENGINEERING**

### **AUTOMOTIVE SAFETY & INFOTRONICS**

#### **UNIT 3 – SAFETY EQUIPMENTS AND COMFORT SYSTEM**

#### **TOPIC 6 & 7: AIRBAGS & ELECTRONIC SYSTEMS**



# PRESENTATION OUTLINE



- Introduction
- History
- Basics of Airbag
- Main Parts of Airbag
- Sensors
- Types of Airbags
- Working





# AIRBAGS



- Supplementary restraint system for the driver and/or passenger safety in case of a crash



# INTRODUCTION



- Seat belts provided the sole form of safety in cars
- Airbags were developed
- A soft pillow to land against in a crash
- They are gas-inflated cushions
- The first patent on an inflatable crash landing device was filed during World War II
- Airbags are the subject of serious scientific research and tests



# HISTORY



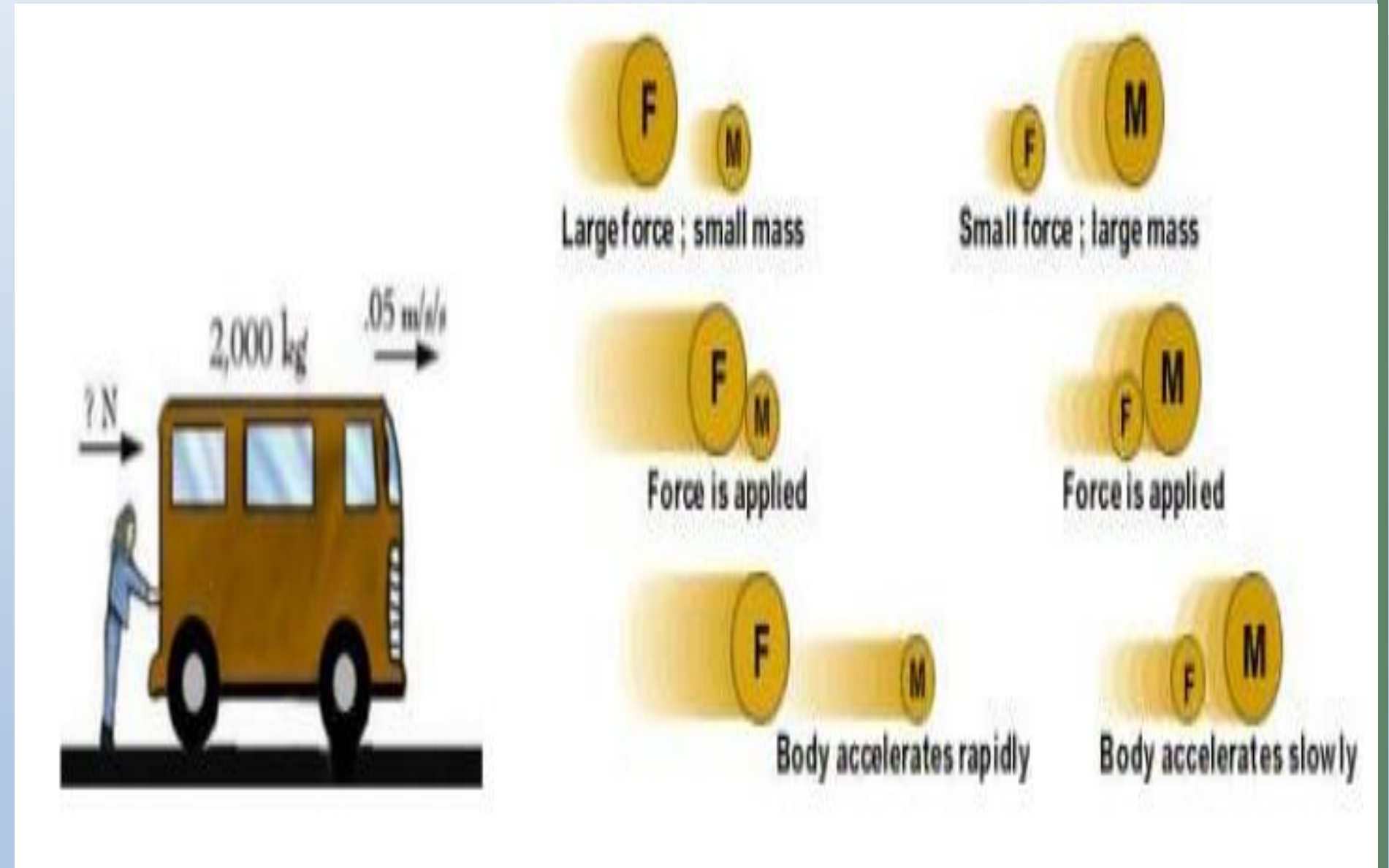
- The airbag specified for automobile use traces its origins as early as 1941
- First invented by Walter Lind and John W. Hetrick
- At the beginning compressed air was used



# BASICS OF AIRBAGS

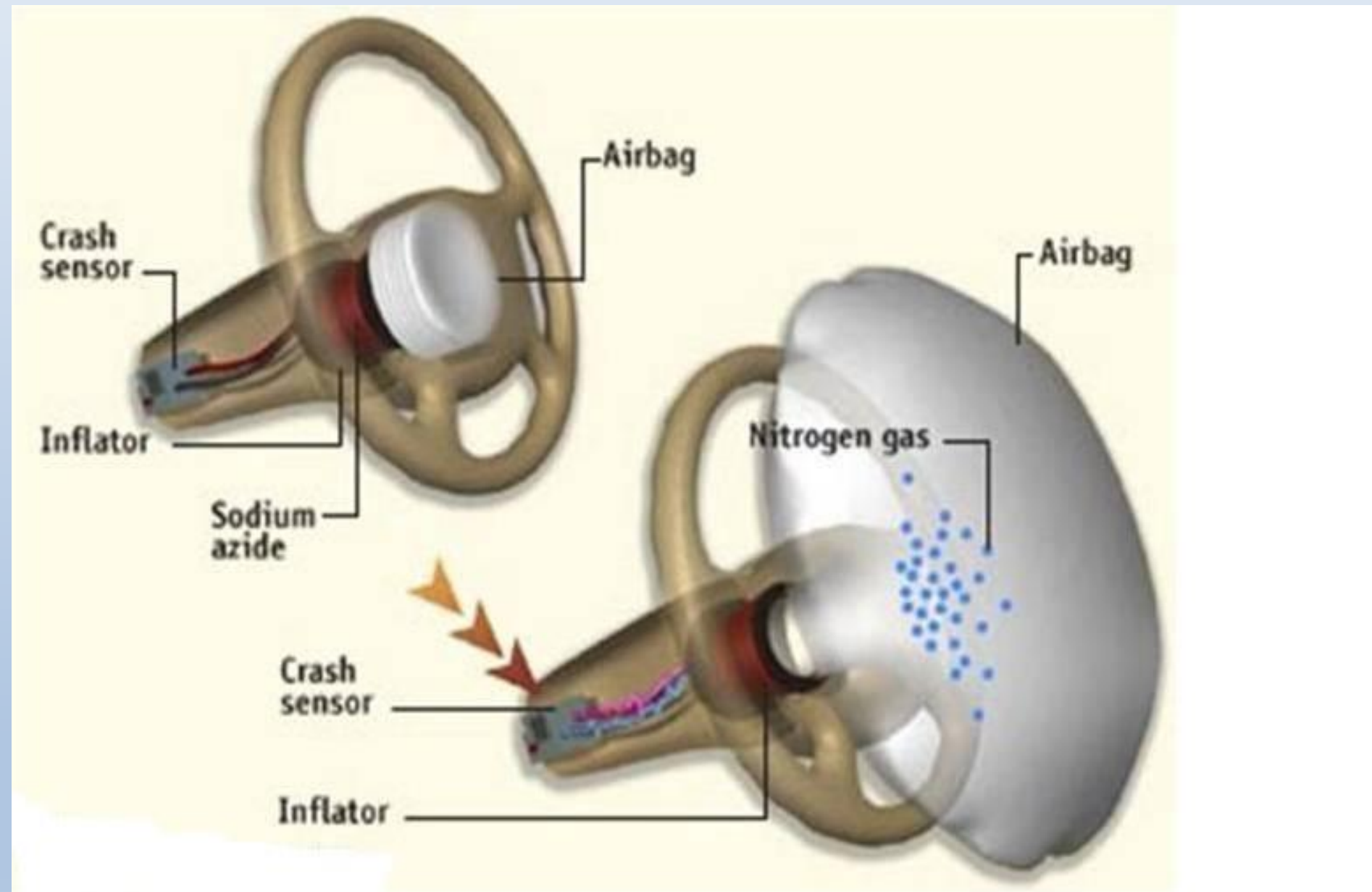


- Newton's second law of motion
- If objects aren't restrained they will continue moving at the speed of the moving car even if the car is stopped by a collision
- All airbags need to do is slow down the passengers speed to zero





# MAIN PARTS OF AN AIRBAG



- **Bag**
- Made of thin nylon fabric, folded into a steering wheel or dashboard or more recently the door or seat
- **Sensor**
- Actuates the airbag to inflate
- **Inflation system**
- The rapid pulse of hot nitrogen gas to inflate the bag



# MAIN COMPONENTS

- Airbag module
- Diagnostic Unit
- Crash Sensors







# AIRBAG MODULE

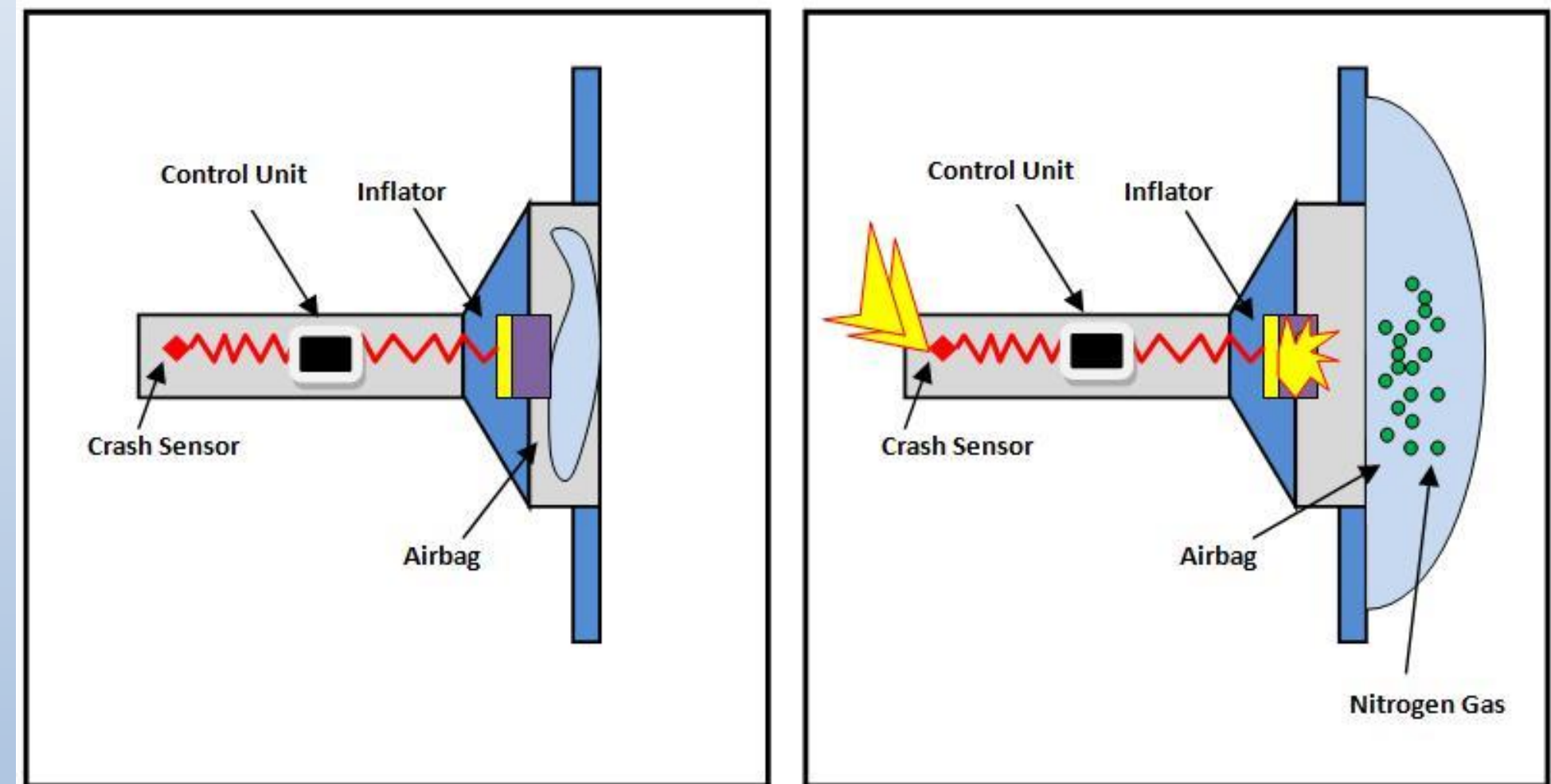


- Contains both inflator unit and light-weight fabric airbag and is located either inside
- Steering wheel hub
- Above glove compartment
- Near side compartment (as separate/combined head/side/window curtain airbag)
- Thin nylon fabric bag folded neatly into steering wheel that inflates to the size of a large beach ball on impact



# INFLATOR UNIT

- Contains a number of sodium oxide pellets which are electrically ignited to produce  $N_2$  that then fills the airbag
- This is preferred to storing compressed gas in the unit (space, durability)





# DIAGNOSTIC UNIT

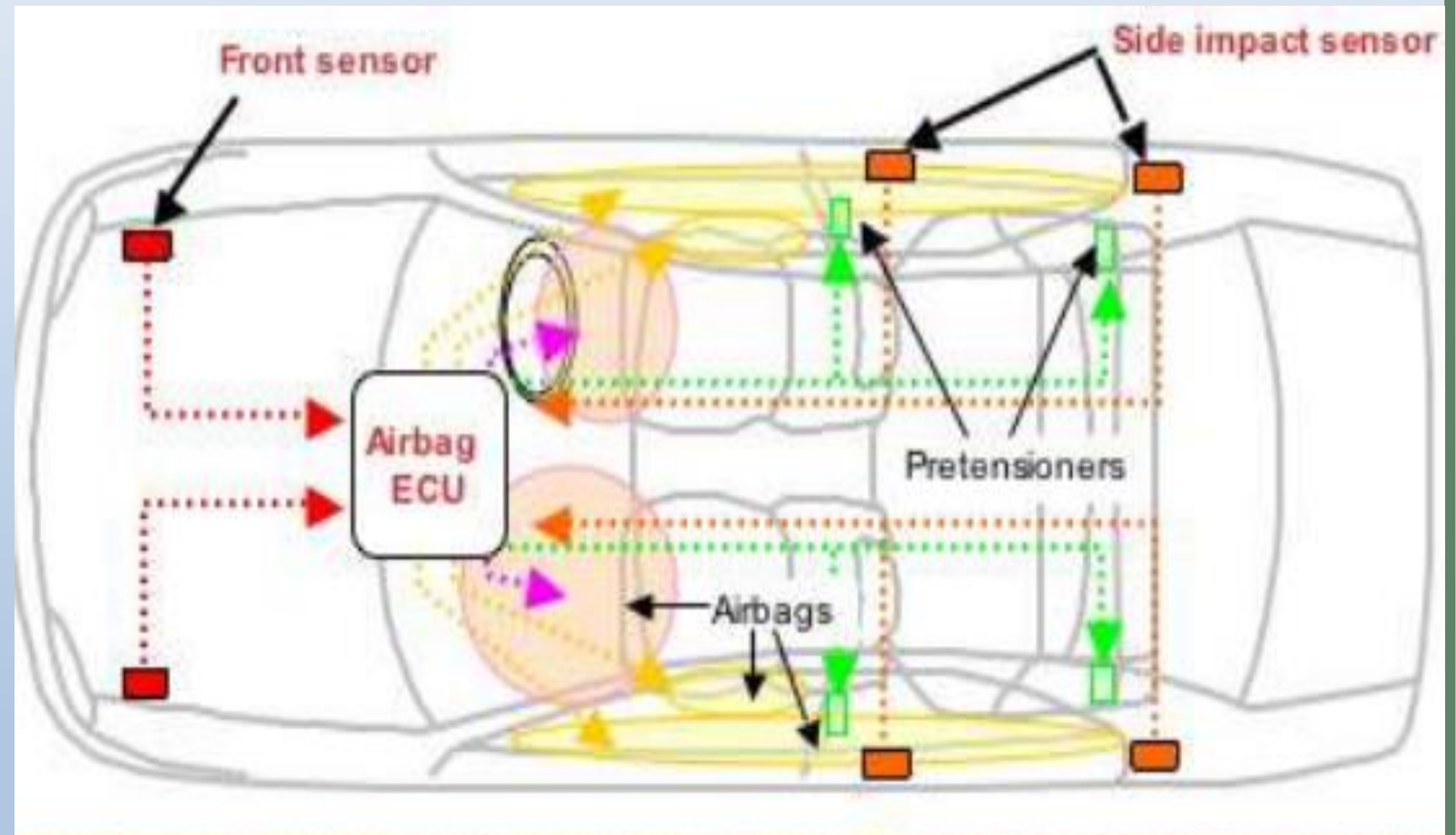


- Enables inflator unit and sensors when vehicle is turned on, performs self check
- Constantly monitors airbag readiness and indicates malfunctioning through an indicator on dashboard
- Usually stores electricity to activate airbag in the event that a crash damages the battery / link to battery



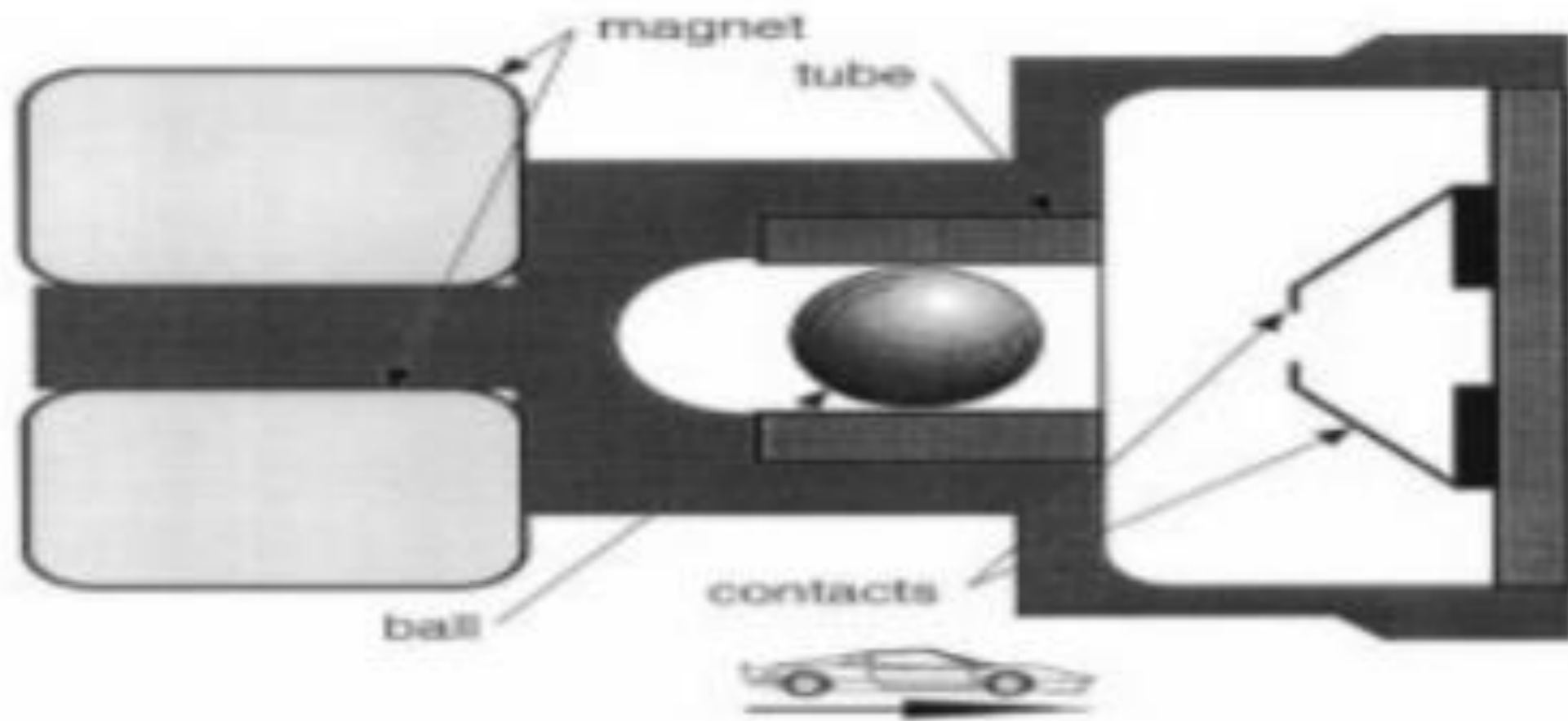
# CRASH SENSORS

- Several crash sensors located in the front of vehicle and in the passenger compartment
- Each senses the sudden deceleration or impact in the event of a crash and flips a mechanical switch to indicate a crash





# BALL IN TUBE SENSOR



- The airflow generates an aerodynamic drag force that dampens the ball motion



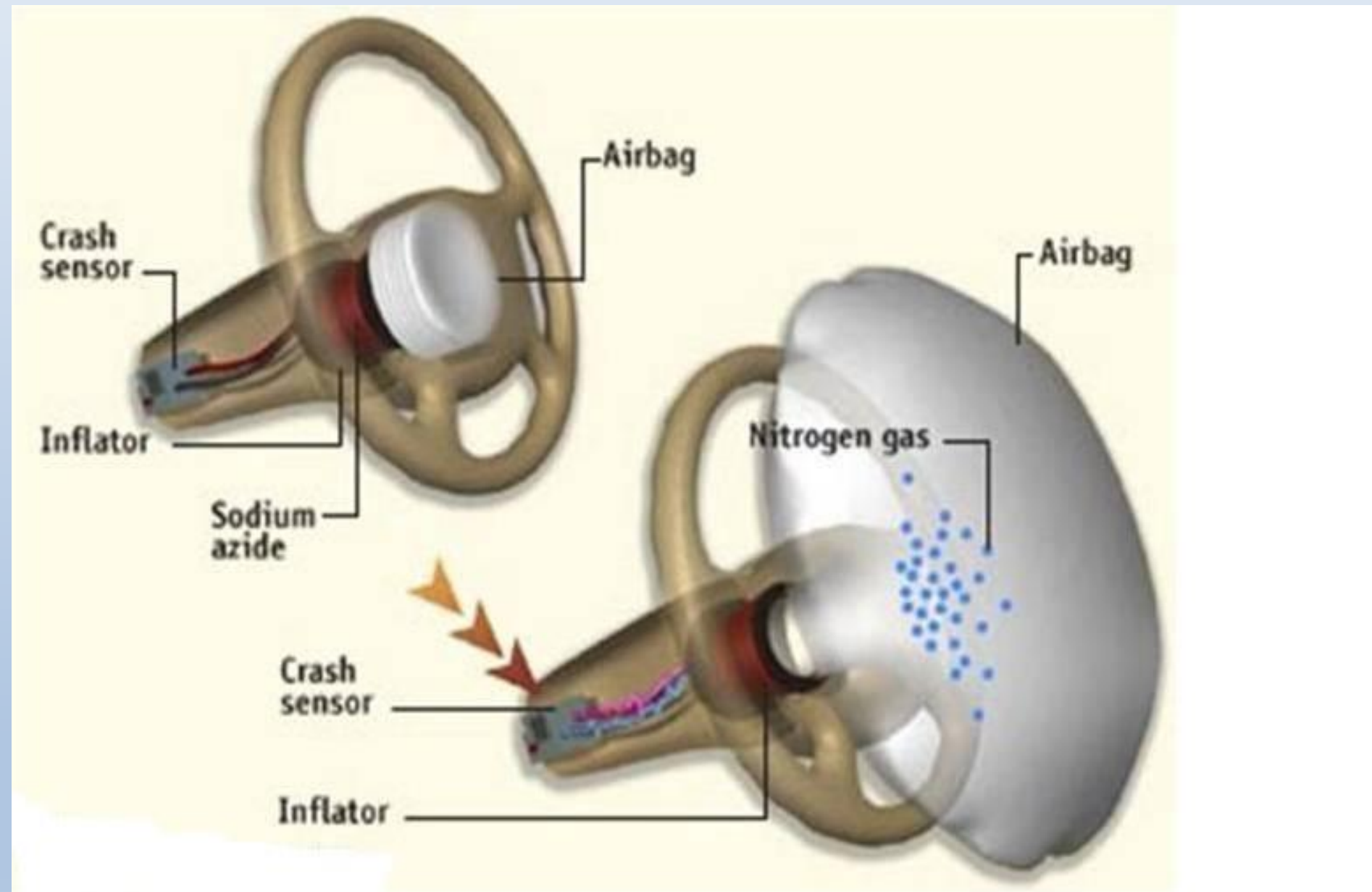
# TYPES OF AIRBAGS

- Frontal airbags
- Side airbag
- Shaped airbag
- Curtain airbag
- Knee airbag
- Centre airbag





# WORKING



1 crash scenario: Car crashes into an obstacle at 20+ mph Sensors detect the deceleration and control unit activated

Low sensitivity: To guard against accidental deployment on hard braking, sensors detect collisions into a barrier at speeds greater than 8-14 mph only as

An electric current is used to heat a filament wire that ignites the  $\text{NaN}_3$  capsules, producing  $\text{N}_2$



# REFERENCES



- <https://www.nhtsa.gov/equipment/air-bags>
- <https://crashstats.nhtsa.dot.gov/Api/Public/ViewPublication/812683>

*Thank you*