



Airbags – The nuts and bolts

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Recently



Overview

- History
- Technology
 - How it works
 - Components
 - Support Technology
- Costs
- Injuries & Fatalities
- Effects on child passengers



Introduction to airbags



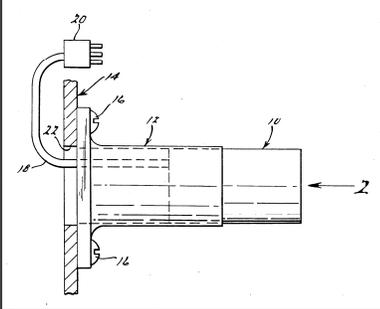
History

- John Hetrick Invented in 1952, patent 1953
- Original Airbags were air filled bladders
 - Compressed air
 - Compressed Nitrogen gas
 - Carbon Dioxide
 - Water & Potassium
- Dr. David Breed invented the ball in tube sensor (first used 1967 – Chrysler)



History (cont.)

- Ball-N-Tube Sensor



History (cont.)

- Airbags for US introduced in mid-1970's – as a convenient alternative to seatbelts
- Ford introduced experimental fleet "Autoceptor" 1971
- GM offered "Air cushion restraint system" in experimental fleet 1974

History (cont.)

- Air bag development coincided with international legislation
- Seat belts put air bags on hold till the 1990's
- Mercedes-Benz S-Class 1980
- Porsche 944 turbo 1987
- Ford & Chrysler (Standard) 1990
- Side airbags 2000's

History (cont.)

- 7/11/1984 required airbags by 4/1/1989 – US
- Light trucks 1995 – US
- Dual airbags & De-powered 1998
- 2006 – Motorcycle airbag (Honda)



Technology

- Just how fast does an airbag deploy???

Technology (cont.)



Technology (Cont.)

- Designed to deploy at frontal, near frontal
- Approximate speed is 14 mph (Solid object)
- Varies due to angle of crash (too high, too right)
- Deployment based on deceleration
- Rolomite – very low friction bearings
- MEMS Accelerometer – Microelectromechanical system (today)

Technology (Cont.)

- The chemistry:

	<i>Reactants</i>	<i>Products</i>
• Initial Reaction	NaN_3	Sodium & Nitrogen
• 2 nd Reaction	Na KNO_3	Potassium Oxide Sodium Oxide MORE Nitrogen
• 3 rd Reaction	K_2O Na_2O SiO_2	Glass ?????

Technology (Cont.)

- Airbags are designed to deploy in a fire of 300-400 degrees
- Complex algorithms now analyze crash conditions
 - Occupant weight
 - Severity of crash
 - Seatbelt effectiveness

Technology (Cont.)

- System components:
 - ACU – Airbag Control Unit
 - Steering wheel with airbag
 - Igniter – Spark type ignition of propellant
 - Propellant – Sodium azide (rocket fuel), now nonmetallic oxidizer
 - Bladder – actual bag

A photograph of a rectangular, silver-colored electronic control unit, likely an Airbag Control Unit (ACU), mounted on a yellow plastic base with several screws.

Technology (Cont.)

- A BOMB in the car???

Technology (Cont.)

A photograph showing a white, inflated airbag deployed from a steering wheel. The airbag is partially obscured by a person's hand and arm. The logo "Triwood 1978" is visible in the top left corner of the image.

Triwood
1978

Technology (Cont.)

- How do they know when to go off???

Technology (Cont.)



Technology (Cont.)



Support Technology

- Airbag Design and final testing...

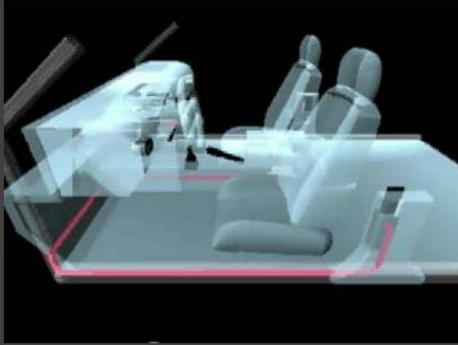
Support Technology



Support Technology (Cont.)

- Airbag systems and seatbelt pre-tensioners.

Support Technology (Cont.)



Support Technology (Cont.)

- Who are you calling a "Dummy"?

Support Technology (Cont.)



Costs

- Airbags cost approximately \$500 installed
- They do have a shelf life
- After crash replacement, Insurance companies only allow new bags
- Some vehicles may be a total loss when the airbags deploy

Injuries & Fatalities

- Airbags made of us market trigger much faster
- All ACU's know if the seatbelts are used
- Minor injuries usually
- 1990 first airbag fatality reported
- 1997 peak of 53 deaths due to airbags
- As of 1/1/2008:
 - 3.3 million deployments
 - 175 deaths – 104 children & 71 adults
 - 6,377 lives saved

Effects to child passengers

- Kids ride in the back until they are teenagers
- Never place a rear-facing restraint in the path of a frontal airbag
- Never place objects between kids and the airbags



Effects to child passengers (Cont.)



Conclusion





- Airbags are to be respected not played with...

Now here are some dummies



Questions?

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About that Crosstour?



Crosstour

- 2010 Honda Accord Crosstour with 1569 miles
- Collision at <30 MPH

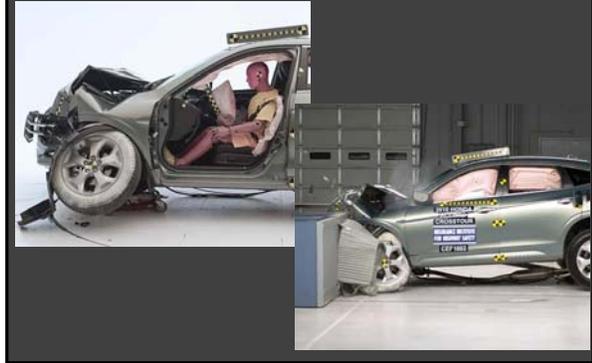


Crosstour

- Air bag sensor bracket and sensor



Crosstour



Damage = \$5,434.00
Damage with airbags = \$16,434.00