

Heavy Rescue

Session 2
Airbags/Vehicle Safety Systems, Other Extrication Tools and Techniques




Suffolk County Fire Academy


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Course Overview

4 Sessions

- **Session 1** – Vehicle Components/Construction, Size-up and Vehicle Stabilization, Basic Extrication Tools, and Extrication
- **Session 2** – Airbags/Vehicle Safety Systems, Other Extrication Tools and Techniques
- **Session 3** – Hybrid/Alternative Fuel Vehicles, Advanced Vehicle Stabilization and Extrication
- **Session 4** – Air Bags, Pneumatic Tools, Other Lifting Tools, Final Exam and Course Evaluation.

**** ALL SESSIONS REQUIRE PPE ****



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Session Objectives

- Describe vehicle airbag and safety system components
- Identify locations where airbags and safety system components may be found
- Recall how best to stay safe around airbags and vehicle safety system components
- Identify other tools used for vehicle extrication to include rams
- Employ vehicle extrication procedures appropriate for specific scenarios including side removals, dash displacements, and third door conversions.

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Vehicle Airbags / Vehicle Safety System



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Airbag History



- First seen in vehicles in the 1970's
- 1998 Federal Motor Vehicle Safety Standard 208 required all new vehicles to have dual frontal airbags
- Today passengers are virtually surrounded by various airbag systems
- Must be used in conjunction with seatbelts to be effective
- Reduced deaths from frontal collisions by 30%.



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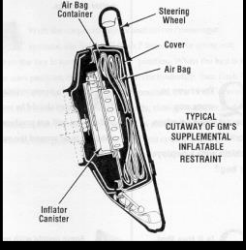
Airbag System

- Airbag module
 - Airbag
 - Inflator
 - Igniter/Inflator Squib
- Electronic control unit (ECU)
- Crash sensors
- Airbag on/off switch.

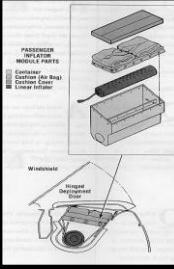



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Airbag System



Driver Side

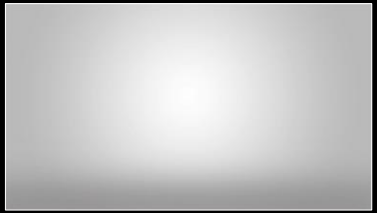


Passenger Side


TYPICAL CUTAWAY OF GM'S SUPPLEMENTAL INFLATABLE RESTRAINT

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How Airbags Work




"Smoke" Is Part of Chemical Reaction




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Crash Sensors

- **Older models** – pressure sensors
 - Sense crushing force
- **Today** – micro-machined accelerometers
 - Sense vehicle position and extreme deceleration
- Can be mounted in various areas around the vehicle.







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Electronic Control Unit (ECU)


- **"Brains" of the entire safety system**
 - Airbags
 - Seat belt pretensioners
 - Rollover protection
- **Typically mounted in center of vehicle.**

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Electronic Control Unit (ECU)



- **After disconnection of 12v system:**
 - **First Generation** – 20 - 30 minutes for power drain
 - **Today's** – have capacitors which drain within seconds
- **Caution** – Inadvertent ECU Damage During Extrication Could Still Cause Airbag Deployment.



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Airbag System Markings

- **SRS** – Supplemental Restraint System
- **SIP** – Side Impact Protection
- **SIR** – Supplemental Inflatable Restraint
- **Above found on airbag locations**
- **Can also be on visor or near Vin #.**

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Airbag Types




Various Side Impact



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“Smart Airbag Systems


- **Sensors detect if seat is occupied**
- **Can detect the size of the occupant (altering deployment strength)**
- **Caution - Undeployed airbags may be activated as rescuers move around a vehicle.**



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Airbag Safety

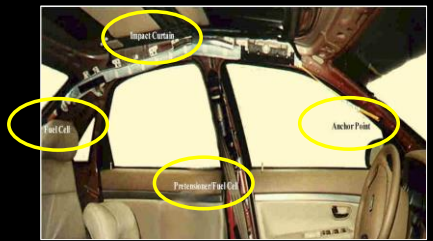
- **Awareness is the key**
 - **Identify the presence of airbags (deployed/undeployed).**
- **Disconnect 12v battery (negative first)**
- **Be aware of your positioning to undeployed airbags**
- **Follow 5-10-20 Rule:**
 - **5” away from side impact**
 - **10” away from driver’s airbag**
 - **20” away from passenger side airbag.**



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Why We Remove The Interior Plastic

- Allow for better tool to material contact
- Exposes components we do not want to cut.



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Why We Remove The Interior Plastic

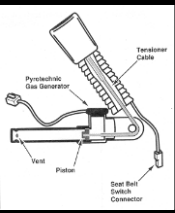


High pressure vessel. Deploys head protection system (located in C Post).

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Seat Belt Pretensioners

- Designed to tighten or back wind seat belt
- Can be electric or mechanical
- Located in the B post
- **Solution:**
 - Cut seat belt early in operation
 - Remove interior plastic so as not to cut pretensioner device.



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Seat Belt Pretensioners



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Roll Over Protection Systems (ROPS)




Can deploy in 3 tenths of a second.



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Other Extrication Tools and Techniques



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Side Removal


Open Entire Side of Vehicle with Minimal Cuts



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Side Removal

Pop Rear Door



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Side Removal

Cut High On B Post (Avoid Airbag Components)



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Side Removal


- **Cut Bottom of B Post Parallel With Rocker Panel**
 - Cut as deep as possible
 - Avoid seat belt pretensioners.




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Side Removal

- **Spread Door From Rocker Panel**



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Side Removal

- **Spread Until B Post Separates From Rocker Panel**
 - Have cutters ready if need to further separate B Post
 - Ensure seat belt is cut.




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Side Removal


- **Swing Open Entire Side of Vehicle**



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Side Removal

- **Cut or Spread Front Hinges To Remove Entire Side**



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Dash Displacement

- **Two options for dash displacement:**
 - Dash roll
 - Dash lift
- **Hydraulic rams can be used for these evolutions.**



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Rams and Ram Rail

- Rams can be fixed or telescoping
- Base of ram (fixed end) at base of B Post
- Ram piston (movable end) at lower hinge point of A Post
- Ram Rail:
 - Allow for larger door span
 - Strengthens weak B post
 - Provide increased angle for better lift.



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Dash Roll

- Increases space to remove victims pinned under dash



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Dash Roll

- Relief cut made parallel to rocker panel
- Metal hook is used to keep cutter from "walking" into passenger compartment
- **Never place yourself between the tool and the vehicle.**



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Dash Roll

- Relief cut in upper fender rail (deep as possible)



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Dash Roll

- Position and extend ram



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Dash Roll

- Wedges used to crib space during lift



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Dash Lift


- Increases space to remove victims pinned under dash



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Dash Lift


- Relief cut made at bottom of quarter panel



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Dash Lift


- Relief cut in upper fender rail (deep as possible)



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Dash Lift


- Horizontal relief cuts between hinges



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Dash Lift

- Use spreaders to pinch and bend tab away



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Dash Lift

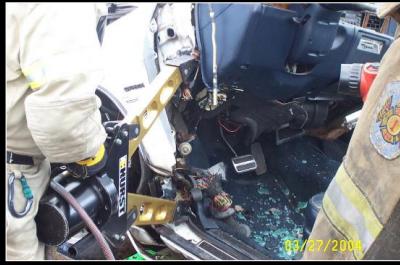
- Insert spreaders perpendicular to vehicle



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Dash Lift

· Spread as needed to remove victim



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Third Door Conversion

· Used to access victims in the back seat of two door vehicles



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Third Door Conversion

· Cut rearward at seat level



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Third Door Conversion

· Vertical cut to wheel-well



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Third Door Conversion

· Spreader clamped on cut piece



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Third Door Conversion

· Leverage used to fold piece down



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Summary

- **Airbag systems Includes:**
 - Airbag module
 - Electronic control unit
 - Crash sensors
 - Airbag on/off switch
- **Electronic control units found in center console**
- **Disconnect the 12v system to disable airbags (negative terminal first)**
- **Airbags can be located anywhere in the vehicle**

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Summary (Cont'd)

- **Remove interior plastic to expose safety components and allow for a better cutting surface**
- **Rams can be used for dash rolls and/or dash lifts**
- **Other extrication techniques include:**
 - Full side removal
 - Dash rolls/lifts
 - Third door conversion.

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