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Car Seats: Then and Now

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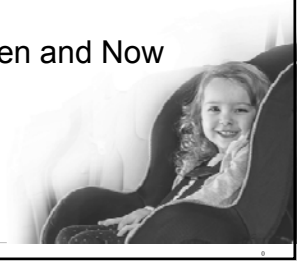

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Objectives

1. Discuss the evolution of car seat design trends from the 1960s to present day.
2. Discuss impact of FMVSS 213 on car seat design.
3. Discuss impact of legislation and other notable moments in CPS history.
4. Review materials currently utilized in car seat manufacturing.

1960s

Car Seats: 1960s

Design Trends

- Metal frames
- Plastic seating surfaces
- No harness
- No belt path
- Steering wheels?!
- Primary purpose: keep child occupied.

Car Seats: 1960s

STANDEE TRAV-L-SEATS

THE NEW MANDARIN LINE

MANDARIN BUCKET SEAT WITH CONTOURED HEADREST

FITZ-ALL SAFETY SEAT

THE NEW LE MANS LINE

1970s

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Car Seats: 1970s

Design Trends

- Metal frames
- Plastic seating surfaces
- Straps & buckles

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Car Seats: 1970s

History

- **1971: FMVSS 213**
  - Required use of seat belt to hold car seat and harness to hold child.
  - Requirements don't cover rear-facing infant restraints or car beds.
- Legislation
  - First state law passed in 1978 (Tennessee).
  - Most people not using child restraints!

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Car Seats: 1970s

1980s

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Car Seats: 1980s

Design Trends

- More plastic
- Less metal
- Tray shields common
- Harness options

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Car Seats: 1980s

History

- **1981: FMVSS 213 inclusion of dynamic testing.**
  - Includes rear-facing infant restraints, car beds and forward-facing restraints for children under 50 lbs.
  - Frontal crash test at 30 mph.
  - Two test dummies:
    - 6 month old (uninstrumented)
    - 3 year old (instrumented)
  - Buckle release force, special labeling and instruction criteria.

Car Seats: 1980s

History (cont.)

- Legislation
  - All states have some type of law by 1985 – many with limitations.
  - Study shows that restraint use higher after CPS laws introduced.
- First Lifesavers Conference held!
- Society of Automotive Engineers develops Child Restraint Task Force to make car seats and vehicle seats fit together (1984).
- Research around use/misuse of restraints.
- National SAFE KIDS Campaign formed (1989).

Car Seats: 1980s

Use the One Step in the back seat of your vehicle. The back seat area is safer, and the rear center position is the safest in most vehicles. **If only one adult is driving with an infant, however, the One Step should be in the front seat (facing backward).**
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1990s

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Car Seats: 1990s

Design Trends

- Mostly plastic
- Widespread use of 5 pt harness systems
- T-Shields/over-head shields

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Car Seats: 1990s

History

- **FMVSS 213:**
  - Includes belt positioning booster seat requirements.
  - Testing with greater range of dummies.
    - Newborn (uninstrumented), 9 month old (uninstrumented), 3 year old (instrumented), 6 year old (instrumented)
  - Changes in forward-facing head excursion requirement, introduction of tether.
- National Child Passenger Safety Board established in 1998.

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Car Seats: 1990s

Present Day

Car Seats: Present Day

Design Trends

- Many types of plastics with different manufacturing processes.
- Metal incorporated into shell.
- Higher harness weights for rear- and forward-facing.
- New types of testing (Ex: rear, side, rollover) and energy management (Ex: anti-rebound bars, load legs, etc).

Car Seats: Present Day

History

- FMVSS 213
  - Expanded coverage to children weighing up to 80 lbs.
  - Incorporated testing with 10 year old ATD (77.6 lbs and 51″). Required for car seats that allow harness use over 65 lbs.
  - LA weight limits.
  - NPRM: Side impact testing.
- Legislation
  - Three states require rear-facing to two years old (NJ, OK, CA).

Materials

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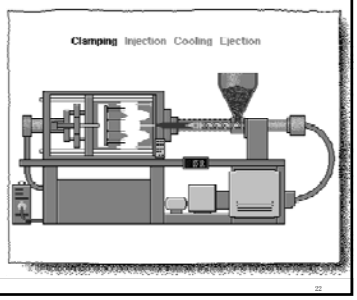
Car Seats: Materials

Plastic Processing

- Injection Molding
- Blow Molding
- Thermoform
- Die Cut
- Steam Chest
- Reaction Injection mold



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Car Seats: Materials

Plastics

- **PP (Polypropylene)**
  - Uses: seat, bases, covers and large components.
  - The most prevalent of the materials used in car seats. Very tough!

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Car Seats: Materials

Plastics

- **Urethane Foam**
  - Uses: head area or integrated into pad.
  - Very soft and deforms under light loads. Absorbs energy.
- **EPS (Expanded Polystyrene)**
  - Uses: cover seating surfaces and head contact areas.
  - Absorbs energy and deforms under load. Very little rebound. Not very durable.
- **EPE (Expanded Polyethylene)**
  - Uses: cover seating surfaces and head contact areas.
  - Absorbs energy and deforms under load. Some rebound overtime. More durable.
- **EPP (Expanded Polypropylene)**
  - Uses: cover seating surfaces and head contact areas.
  - Absorbs energy and deforms under load. Rebound over time. Very durable.

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Car Seats: Materials

Plastics

- **ABS (Acrylonitrile butadiene styrene)**
  - Uses: handles and levers, adjustment knobs and mechanisms
  - More expensive. Deep color and nice finish.
  - Stiffer, but brittle.
- **POM (Polyoxymethlene - Acetal or Deltrin)**
  - Uses: mechanisms, handles and actuators.
  - More expensive.
  - Very stiff , more brittle (less tough).
  - Slick with good wear properties for moving parts.
- **TPO (Thermo Plastic Olefin)**
  - Uses: contact areas to create a soft touch surface.
  - Not load carrying.

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Car Seats: Materials

Metal

- Steel
  - Uses: car seat frame.
  - Higher strength than predecessors from the 1960s/1970s.
  - Designed into car seat in ways to increase strength and provide additional energy management properties.
- Aluminum
  - Uses: components, ex: CFA.
  - Does not rust.
  - Good wear properties for moving parts.
- Spring Steel
  - Uses: components/springs.
  - Good wear properties for moving parts.


thank
you