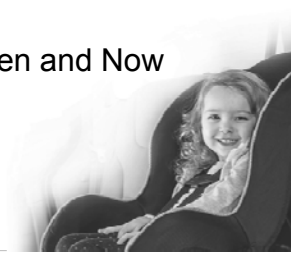


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Car Seats: Then and Now

Sarah Haverstick, CPSTI
April 2016



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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.

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1960s




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Car Seats: 1960s

Design Trends

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



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Car Seats: 1960s

STANDEE TRAV-L-SEATS
THE NEW MANDARIN LINE

MANDARIN BUCKET SEAT WITH CONTOURED HEADREST
F168 — Featuring the all NEW Electronically welded, contoured headrest for maximum safety and comfort. Has all the strength and beauty you expect in a KANTREX car seat. Extra heavy weight, new, electronically-welded back and seat in the new Blue and Gold Mandarin pattern with leather-like back, seat and headrest. Fine one fitting, sturdy chrome tubular four spoke spring base and crash strip. (Ship weight approx. 7 lbs.)
F168 — Same as F168 but in Blue
F168B — Same as F168 but in Burg

FITZ-ALL SAFETY SEAT
THE NEW SE HAN LINE

SE HAN — Between front bucket seats, between bucket seats, behind or back of second row seats, in a MANAGER BOX LINE KANTREX SERVICE STATION. RESPOND TO YOUR STORE!

SE HAN BUCKET SEAT WITH NEW CONTOURED HEADREST
 As new as today's steel auto seating... it's the ultimate bucket seat. Featuring our new contoured, new high back and heavy one piece thick padded guard rail. Comes in new Mand pattern.

F168B — Featuring the all NEW Electronically welded contoured headrest for maximum safety and comfort — automatically attached for extra one two more strength or go with the new chrome. Fine heavy one electronically-welded back and seat in the new Mand pattern with electronic spring in blue with leather-like upholstery. Fine magnetic construction. Equipped for a lifetime with 100% heavy duty, sturdy chrome tubular frame. **EPSX SEAT SERVICE FOR ADDED SECURITY**. Padded guard rail, matching wheel covers and **CRASH STRIP**. New headrests and base for added safety. (Ship weight approx. 9 lbs.)

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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



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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.

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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).

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Kantwet ONE STEP
Model 421 Vinyl Pad Model 422 Cloth Pad



INSTRUCTIONS

NO VEHICLE SEAT REQUIRED

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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Design Trends

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



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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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booster car seats

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Present Day



everflo 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).

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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).

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Materials

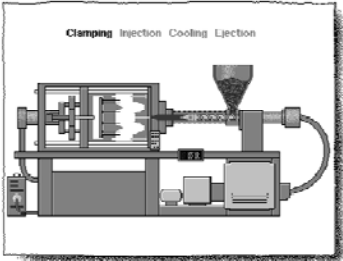


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Car Seats: Materials

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!

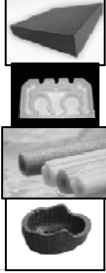


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everflo Car Seats: Materials

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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Plastics

- **ABS (Acrylonitrile butadiene styrene)**
 - Uses: handles and levers, adjustment knobs and mechanisms
 - More expensive. Deep color and nice finish.
 - Stiffer, but brittle.
- **POM (Polyoxymethylene - Acetal or Delrin)**
 - 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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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.



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