Consumer Report’s Child Seat Test Methods and Findings

Jennifer Stockburger
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Consumer Reports Auto Test Center

Automotive Testing Since 1936
Child Seat Testing Since 1972

Three Tiered Approach
Crash Performance / Sled Test Performance

Ease-of-Use

Fit-to-Vehicle

Ease-of-Use Factors

- Product assembly
- Seat weight
- Harness adjustment
- LATCH connections and adjustments
- Buckle use and adjustment
- Adjusting and viewing recline angle
- Carrier connection and removal
- Handle adjustments
- Belt routing
- Transitioning: rear-forward-booster
- Storage for extra parts not used
- Seat care
Labels

- Model information
- Manufacturer contact information
- Expiration date
- Harness height
- Chest clip position
- Owners manual storage
- LATCH and tether storage
- Belt paths clearly labeled
- Allowable handle positions
- Spanish labels
- Accessory use

Instructions

- Basic product use criteria
- Clear adjustment criteria
- Clear installation instructions and diagrams
- Are the labels and manual consistent with each other
- Soft goods cleaning, removal and installation
- Accessory instructions
- Availability of online instructions
- Spanish instruction
- Installation videos
- Sources for installation help

Fit-to-Vehicle Testing

- 5 vehicles (varying geometry and types).
- Installation in each unique seating position and orientation.
- ~40 individual installations per model depending on seat type
- Current ratings = +4,000 individual installations
Vehicles Used For Fit Evaluations:
- Small sedan
- Small SUV
- Large SUV
- Family sedan
- Minivan


Fit-to-Child: Boosters
- Fit-to-vehicle cars & crash test bench
- Parent/Caregiver level of assessment
- Evaluation made after dummy is moved – key to result differences

CR Child Seat Sled Test Protocol Objectives

*Develop a test protocol to be more REPRESENTATIVE of current vehicle geometry run at a higher speed than current testing*

Modifications:
1. Test Bench – Use test bench with geometry/stiffness of current vehicle seats
2. Blocker - Add front seatback surface for interaction potential
3. Crash Pulse - Update crash pulse to a 35mph pulse based on vehicle crash tests
Vehicle Seat Selection

- Targeting "average" geometry and stiffness
- CR's Vehicle Test Fleet – MY 2008-2010
  - Seatback angle
  - Seat cushion angle
  - Seat cushion length
- Cushion stiffness testing and data comparison

2009-2012 Ford Flex 2nd row outboard (captain's chair)

Vehicle Seat Selection

Vehicle Cushion Stiffness

- Will use stiffness at front of the seat (possibly more relevant for CR's bottoming out)

Blocker Plate Development

- Extending FMVSS 201 below the belt line
- Typical seat backs:
  - Hard plastic
  - Fabric covered frame
  - Limited padding
Blocker Plate Development

- Tested stiffness of front seatbacks from CR test vehicles
- Chose foam with average stiffness
- Video analysis for front seat movement in vehicle frontal crash tests (~ 4 in.)
- Built-in rotational capability to blocker

Pulse Development

**CR Pulse Characteristics**
Max acceleration: 35 g
Max speed: 35 mph
Rise Rate: 950-1000 g/s

Max G > FMVSS 213
Duration = FMVSS 213

**FMVSS213 vs. CR Crash Test**
- Soft, thick cushion
- Excursion/back angle requirement
- 30mph acceleration pulse
- Minimum standard/compliance test / PASS or FAIL based on HIC, Chest g, Back angle and head / knee excursions

- Cushion from actual vehicle
- Simulated front seatback
- 35mph acceleration pulse
- Comparative ratings for Consumers of BASIC / BETTER / BEST based on HIC, Neck forces and head contact.
Crash Performance

- Not pass/fail test
- Comparative ratings of relative performance
  - Basic – Better – Best
- Note: We consider all seats that get a BASIC rating to be safe

- Scores based on:
  - Statistical analysis
    - Head injury criteria (HIC 15)
    - Upper Neck Axial Force (+Fz, -Fz)
  - Head contact to blocker
  - Structural integrity — could assign a model to “Basic”

New ratings (Ease-of-Use / Fit-to-Vehicle):

Officially launched September 2016 online and in November issue of Consumer Reports Magazine.

Ratings colors are designed to be more universally intuitive:
Green = GO / Red = STOP

How to use the new ratings
Head Contact: Rear-facing Only vs. Convertibles

- Our tests showed greater frequency of head contact with 12 month dummy in rear-facing infant seat than with rear-facing convertible
  - Infant seats: 16 of 30 tested models (excludes those with structural issues)
  - Rear-facing convertible seats: 1 of 23 tested models

- New advice: Switch to rear-facing convertible no later than 1st birthday

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Crash Protection Benefit: Load Leg

Consumer Reports:
- 4 infant seats rated “BEST” for crash protection
- Reduced head injury risk by 46% compared to seats without load leg (CR crash testing)

Government Limitation:
- Seats need to comply without using load leg → 213 sled lacks a floor

Industry Limitation:
- Can’t use load leg in some vehicles → floors with hatches can’t withstand additional forces
CR’s Child Seat Timeline

- Our updated Real Child Seat Timeline reflects the recommendation to switch from infant seat to rear-facing convertible seat no later than 1st birthday.