

Alliance of Automobile Manufacturers

Head Restraint GTR Input

6-13-05

FMVSS 202a: A starting point

- Final Rule published 12-14-04
- Alliance and member company petitions for reconsideration filed 1-26-05
- Major objections to final rule
 - 55 mm backset
 - Additional alternatives needed for retractable rear seat head restraints
 - Clearance to roof
 - Gap measurement method
- Other concerns
 - Height Measurement method

Backset

- Field data indicates that seats designed to meet 50mm backset are irritating to short stature adults
- HRMD does not correlate to human experience
- 25° is not the average of human seating positions
- 3mm/degree backset change is not representative of all vehicles
- More study of HRMD needed for tolerance and accuracy
- Compare J826 HRMD with Aspect HRMD

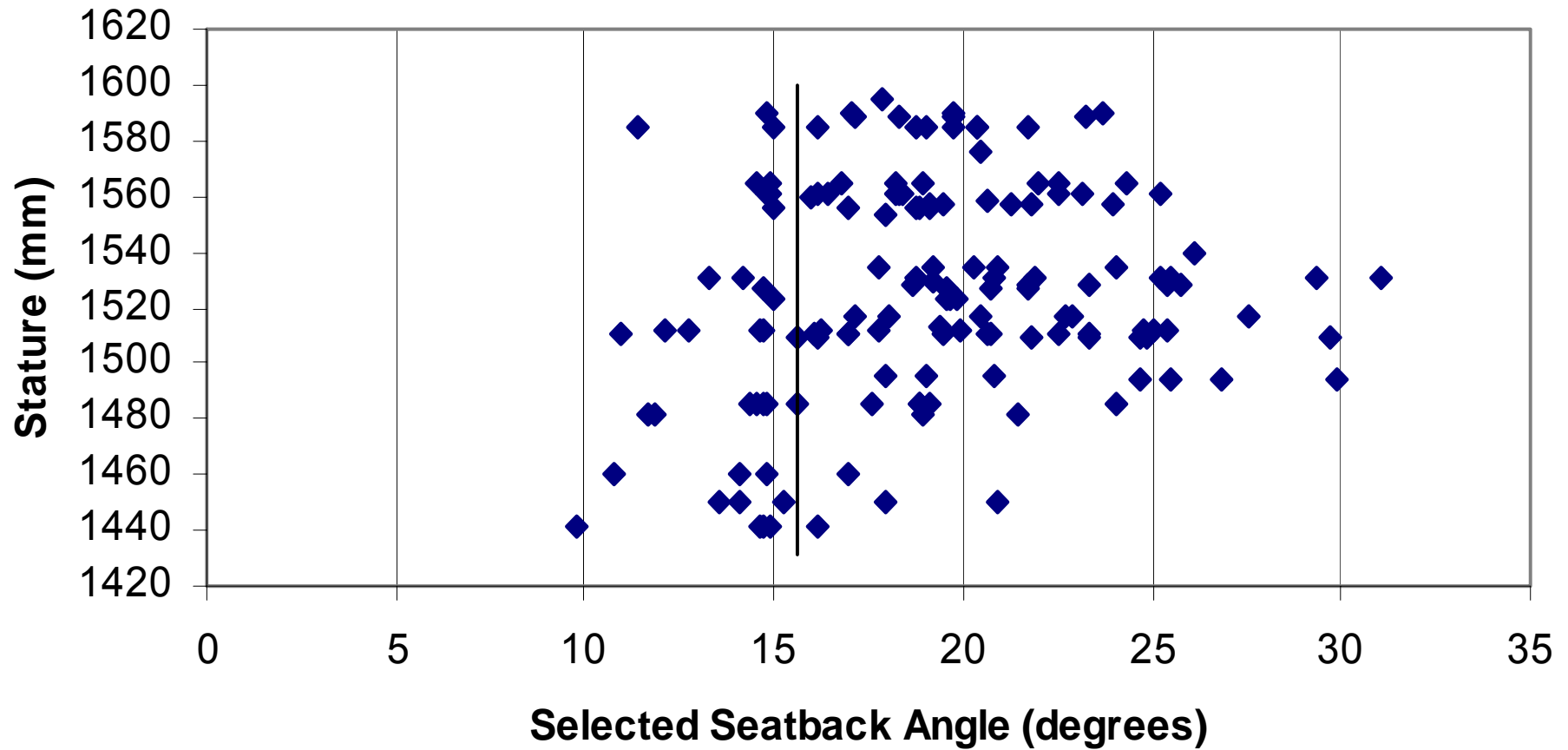
Backset Change w/ Selected Back Angle Shorter Women vs. Taller Men

UMTRI Data (stratified)	Men > 1800 mm	Women < 1600 mm	Seat Back ° Δ (men-women)	Backset Δ (4.3 mm/°) (4.3 x °Δ)
Small Car	25.6°	19.5°	6.1°	26 mm
Medium SUV	25.6°	21.3°	4.3°	18 mm
Medium Car	23.7°	18.4° (limited @ 15°)	5.3°	23 mm
Large Car	26.4°	17.8°	8.6°	37 mm
Minivan	26.3°	19°	7.2°	31 mm

Backset Change w/ Selected Back Angle

- Vehicles must be designed to ≤ 40 mm backset @ 25° to meet 55 mm limit because of variability
- Backset would be zero @ $\sim 16^\circ$ torso angle
($40 \text{ mm} - 4.3 \text{ mm} \times [25^\circ - 16^\circ]$) = 1.3 mm
- Women who choose back angles below 16° would likely experience head restraint interference
 - Additionally drivers may experience such interference when driving downhill

Back Angles Chosen by Shorter^{HR-3-10} Drivers – UMTRI Data



Non-Use Alternatives Permitted by FMVSS 202a

- **FMVSS 202a Section 4.4: Folding or Retracting Rear Head Restraints:**
 - (a): The head restraint must automatically return to a position in which its minimum height is 750 mm when a test dummy representing a 5th percentile female Hybrid III is positioned in the seat.
 - (b): The head restraint must be capable of rotating forward or rearward by not less than 60 degrees from any position in which the minimum height is not less than 750 mm.
- **FMVSS 202a Section 4.5: Removability of Head Restraints:**
 - The head restraint must not be removable without a deliberate action distinct from that necessary for adjustment.

Non-Use Alternative PROHIBITED by FMVSS 202a

A head restraint that can stow into a full-down position of <700mm, yet allow for an occupant-adjusted position of >700mm is prohibited.

Issue Raised in Alliance Petition

Outboard Rear Seat Non-Use Positions:

- Allow outboard rear head restraints that stow into a full-down position of $<700\text{mm}$, yet allow for an occupant-adjusted position of $>700\text{mm}$.

These head restraints are to be capable of achieving 750mm in an adjusted position and meet retention and energy absorption requirements specified in the standard.

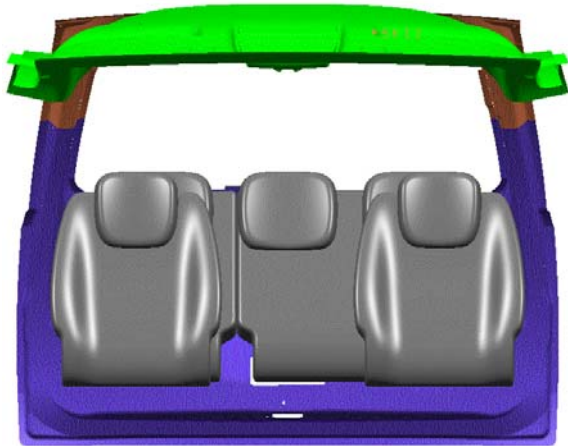
Potential Impact of Continuing to Prohibit^{R-3-10} Non-Use with Manual Adjustment to 750 mm:

- Higher level of customer complaints on Visibility (J. D. Power)
- Increased media criticism due to reduced visibility and more difficult seat stow functionality (Consumer Reports and others)
- Higher level of customer complaints on ease of vehicle use (seat stow functionality) (J.D. Power)
- Reduced sales appeal: flexibility of vehicle architecture
- Increased risk of removal, damage and mis-use (Effect opposite what is best for safety)
- Drives to higher cost, higher mass, more architecturally restrictive alternatives

Retractable Head Restraints

- Current provisions in FMVSS 202a are incompatible with fold-tumble-stowable seats. These designs must be preserved.
- Additional options must be provided (e.g. 5° torso angle change in retracted position)
- Retractable are preferable to removable for convenience, availability and rear visibility

Rear Visibility Retractable vs Fixed Head Restraints



Allowing Non-Use with Manual Adjustment to 750 mm

Additional rear head restraint alternative in FMVSS 202a would allow enhanced design flexibility for current and future programs

- Encourages vehicle manufacturers to offer outboard rear seat head restraints - less impact to current vehicle architectures, more attractive to future programs
- Offers safety benefit of protection without visibility detriment - encourages use rather than removal
- Can offer similar range of protection as other in-use position designs (if range of adjustment is permitted)
- Head Restraint far more likely to be present in vehicle - less risk head restraints will be removed and not be present when needed
- Less risk of damage to head restraint (loose, removed head restraint)
- Less work by user to re-install than removed restraints – encourages use and presence
- Less risk of mis-install or non-install of head restraints
- Less work by user to reconfigure seats enhances sales appeal

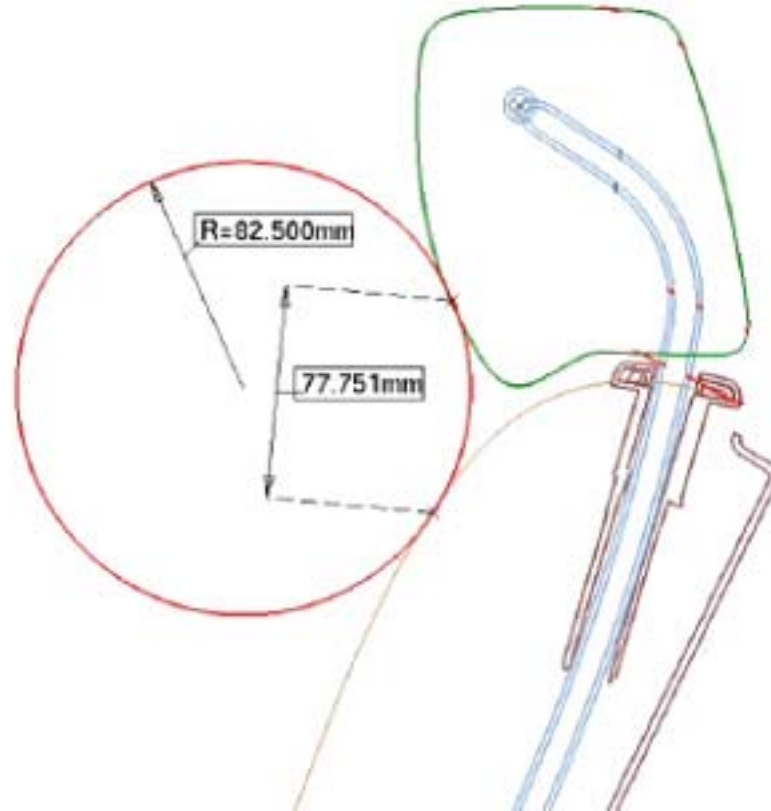
Roof Clearance

- 25mm clearance provision in FMVSS 202a is inadequate.
- Must be measured to inside of head liner not roof line throughout full seat range of motion. Must account for FMVSS 201u.
- Must be measured under lowest area of sunroof frame, not sunroof or sunshade.
- 50 mm needed for convertibles

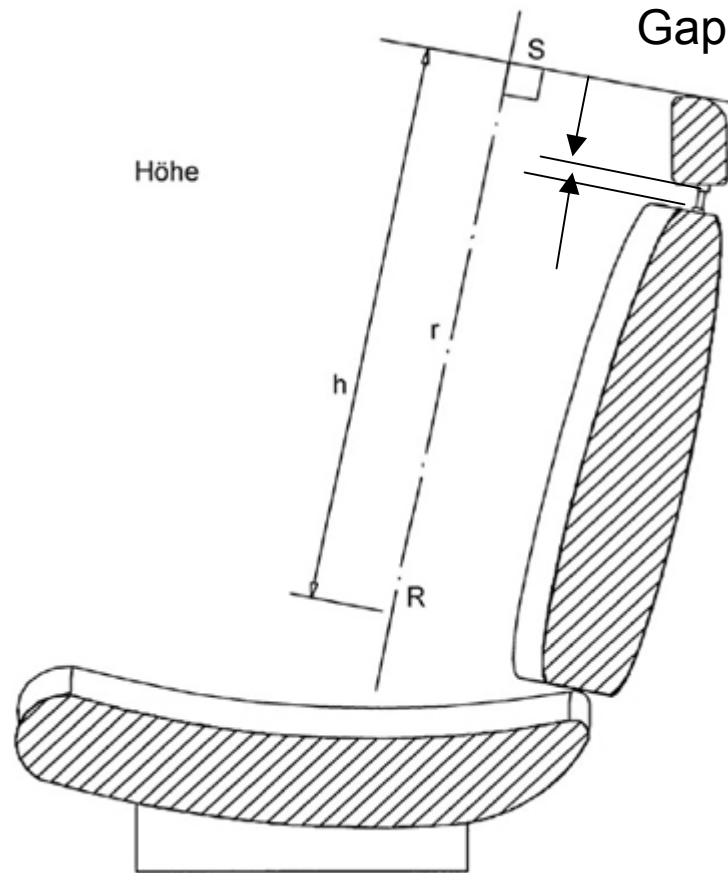
Gap Measurement Procedure

- 60 mm gap using 165 mm sphere between seat and head restraint exaggerates gaps and overlaps.
- Use ECE R17 measurement method.

Present Gap Measurement Procedure



Preferred Gap Measurement Procedure



H/R-point Height Measurement Method

- H point vs R point tolerance differences increases height. Higher height affects:
 - Displacement test
 - Backset retention test
 - 890 N strength test
 - Energy absorption test
- 800 mm “effective” height may satisfy NL height concerns.

“Effective” Height Measurement Method – Fixed Height

5.5.2.1 For static front outboard head restraints not adjustable for height, the height shall be not less than 800 mm when measured from the R-point (design H-point) along the design torso reference line to a line perpendicular to the torso reference line intersecting the head restraint at a point 15 mm (measured horizontally) behind the torso reference line. If the head restraint is adjustable fore-aft, the height is to be measured in the foremost adjusted position.

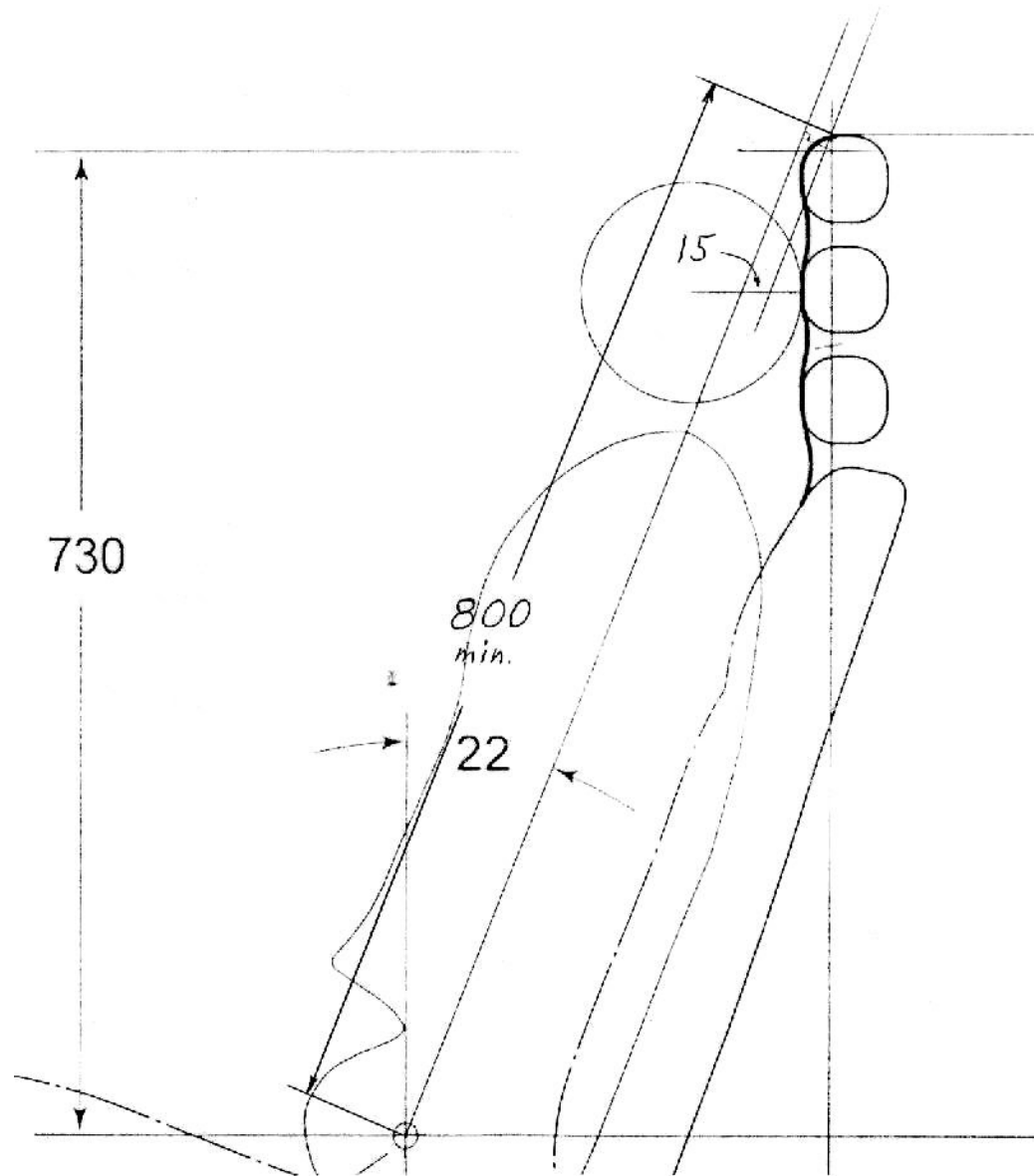
“Effective” Height Measurement Method - Adjustable

5.5.3.1.1 the height shall be not less than 800 mm in the case of static front outboard head restraints when measured from the R-point (design H-point) along the design torso reference line to a line perpendicular to the torso reference line intersecting the head restraint at a point 15 mm (measured horizontally) behind the torso reference line with the head restraint in the highest adjusted position and any fore-aft adjustment in the foremost adjusted position.

“Effective” Height Measurement Method

- UMTRI recommended 730 min. vertical ht. for front O/B head restraints, with surface less than 315 mm behind H-point.
- This equals 795 mm min. height at 20 mm behind torso line (@ 22° torso angle).
- Proposed “effective” ht. minimum is 5 mm higher and 5 mm closer to head.
- Placing rear head restraints this far forward would cause interference to child restraints and boosters.

“Effective” Height Concept



Alliance GTR Proposal based on FMVSS 202a

- 70 mm backset
- Additional alternatives needed for retractable rear seat head restraints (e.g. 5° torso angle change)
- 25 mm Clearance to inside head liner (50 mm for convertibles)
- R 17 Gap measurement method
- 800 mm “effective” height measurement method