

Head Restraints FMVSS 202a & GTR

Alliance of Automobile Manufacturers
December 5, 2006

Purpose of Meeting

- Present data to NHTSA Senior Management for resolution of key head restraint open issues in the GTR and petition for reconsideration:
 - Backset
 - Dynamic testing
 - Non-use positions
 - Backset retention test

Recommendations Summary

- Backset
 - No less than 55 mm at the design torso angle using a measurement method derived from the ECE R17 from the “R” point in place of 80 mm at design torso angle using “H” point (as in petition for reconsideration)
- Dynamic Testing
 - Allow 20 degrees head to torso angle with Hybrid III in the interim
- Non-use Positions
 - Allow 10 degree torso angle, or “discomfort metric” or labels
- Backset Retention
 - Only test in full rear **OR** locked backset position(s)

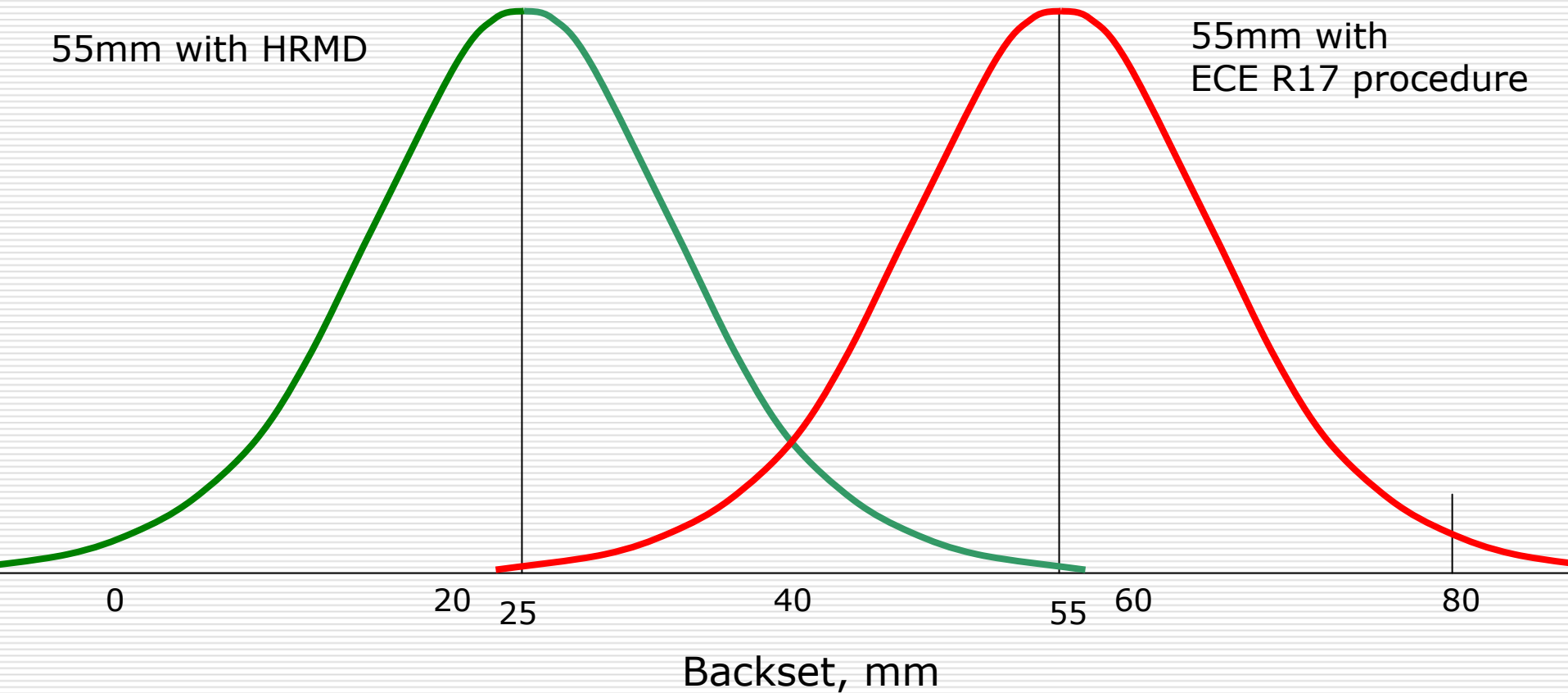
Backset Issues

- ❑ Published backset will create unacceptable levels of customer dissatisfaction.
- ❑ Customer experience with a nominal 50 mm design backset at 25° torso angle has been unacceptable
- ❑ Head Restraint comfort study validates field experience.
- ❑ Tier I Seat Suppliers advise: to meet 55 mm at 25° measuring from "H" Point will require head restraints with a "nominal" design of ≤ 25 mm.
- ❑ Expect head interference at 18°-20° torso angle with 4-5 mm change/deg of torso angle.
- ❑ State of the art seat manufacturing has a 20-50 mm range in "H" point position due to seat structure, foam and trim tolerance variation and configuration (content) differences

Whiplash Benefits are Not Lost with Alliance proposals

- ❑ NHTSA estimates a 3.5% reduction in whiplash injuries with backset of 55mm, for an effectiveness of 5.83%.
- ❑ NHTSA will realize this 3.5% reduction in whiplash injuries with a 55mm requirement measured with an ECE R17 “R” point (seating reference point) derived procedure. If the “H” point is within the tolerance zone, check seat dimensions against the seat assembly drawing to assure dimensional compliance.
- ❑ Depending on vehicle type 8-36% of drivers want more than 55mm backset, and 28-62% want more than 35mm backset.
- ❑ Manufacturers will be designing for 25mm or less to meet the “55mm at 25° torso angle measured with the HRMD” requirement which leads to serious customer acceptance issues.

Design to Meet 80mm Backset Produces 55mm Mean



Backset Recommendation

Addresses the need for customer comfort and accounts for real world seat variation while still providing benefits in the FRIA.

Revise FMVSS 202a and GTR text to:

- Keep the backset requirement at no less than 55 mm at the design torso angle using a measurement procedure about the "R" point (SgRP) derived from ECE R17 in place of a backset requirement of 80 mm at the design torso angle using the "H" point (HRMD) measurement method.

Benefits:

- Allows for design, manufacturing and audit tolerance not accounted for in 12/14/2004 final rule;
- Short stature people, who sit more upright, are expected to benefit the most with respect to comfort;
- FRIA benefits of head restraints are preserved.

Dynamic Testing Issues

- Development of active head restraints are hindered due to injury criteria and lack of a test procedure along with accurate instrumentation
- 12° head-torso rotation limit will eliminate some reactive head restraint systems with “Good” performance from the market
- Provision needed in test procedure for alternate deployment methods such as Trigger Points

Dynamic Testing Recommendation

- ❑ Interim: Increase allowable head-torso angle to 20° which corresponds to 11% risk of injury
- ❑ Long Term: Federalize BioRid or RID3 and develop “equivalent” injury assessment criteria and permit these as an option to the Hybrid III ATD

Non-use Position Issues

- ❑ “+/- 60° rotation” and “automatic return” options in final rule may not work for “fold flat” and “stowed” seat designs
- ❑ Non-use positions are important for rearward visibility
- ❑ Removable head restraints will be removed and may not be available when wanted
- ❑ Additional alternatives to what is permitted in FMVSS 202a are needed

Non-use Position Recommendation

Alliance urges NHTSA to permit all of the non-use alternatives proposed within the GTR draft text including these additional alternatives:

- 10° torso angle change between in use and non-use positions
- Warning label
- 450mm x 55mm, H_{LE} x S “Discomfort metric”

Backset Lock Retention Test Issues

- ❑ Manufacturers currently offer head restraints that provide comfort features (non-locking fore-aft adjustment, side wings, inflatable pillow) to encourage occupants to maintain head restraint position while resting
- ❑ Current test requirement to “test in any position” creates more stringent backset requirement since ANY adjusted position must hold
- ❑ Current requirement will likely eliminate comfort features and may cause occupants to mis-position head restraints while resting

Backset Lock Retention Test Recommendation

- Revise requirement to test and measure adjustable head restraints in rearmost position; **or**
- Revise requirement to test and measure adjustable head restraints in “any locked position”

BACK-UP Slides

Backset

Backset Issues

- Unacceptable rates of customer complaints are expected from restrictive FMVSS 202a backset requirements combined with inherent irreducible seat production variability.
- “H” point vs. “R” point measurement methods provide different results
 - “R” point represents the design (average seat) whereas “H” point represents only one seat.

Customer Complaint Data on 50 mm Backset

- ❑ 2005 DaimlerChrysler SUV
- ❑ Designed to meet FMVSS 202 NPRM 50mm requirement (44 mm backset at 25° to provide compliance margin)
- ❑ Field survey intended to duplicate and predict JD Power survey (268 questions)
- ❑ Aug '04 through May '05 build data
- ❑ 2945 respondents (8/1/05)
 - #1 Miscellaneous Interior
 - #8 Headrests
 - #21 Seat Belt Retractors
 - #37 Seat Belt Buckle

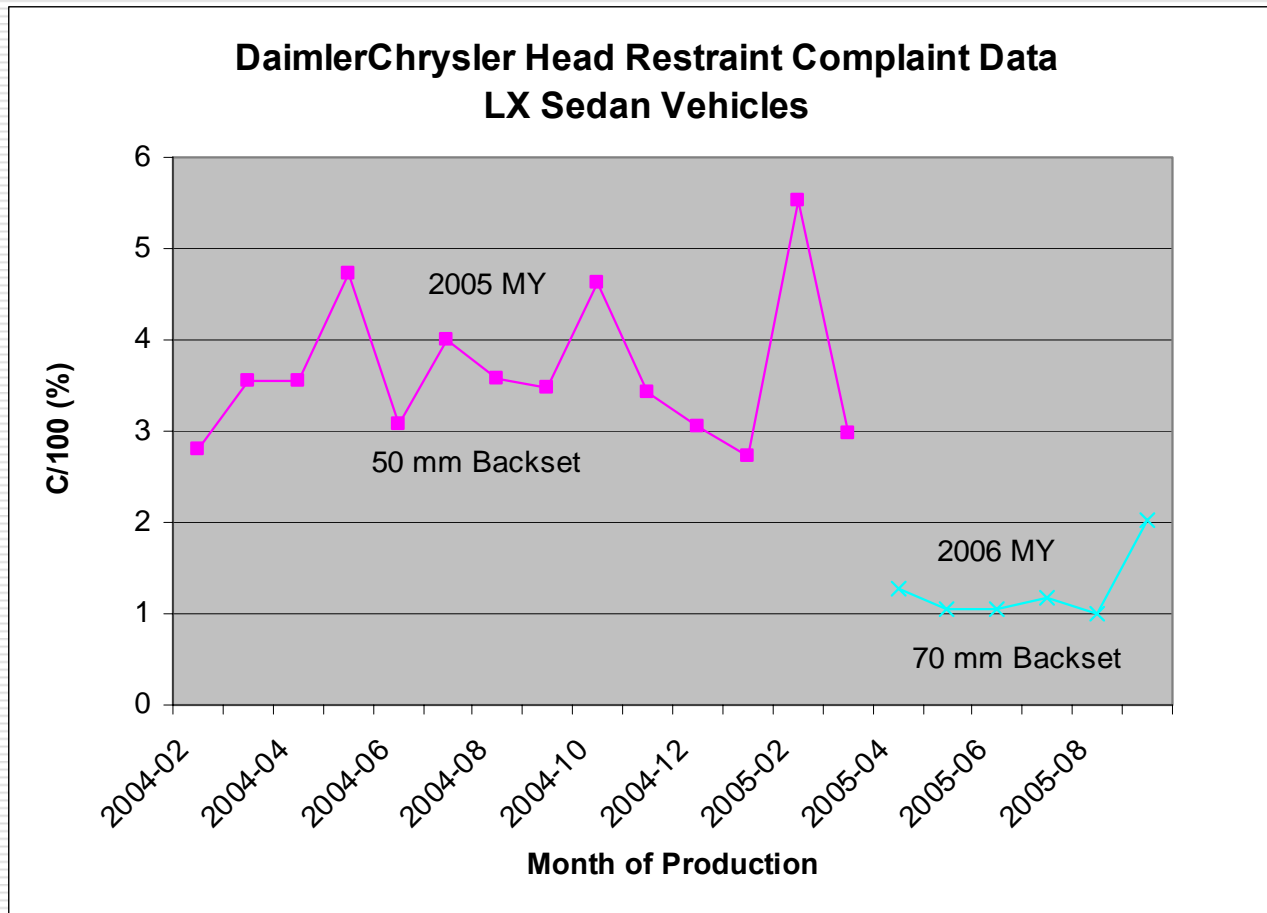
Customer Complaint Data on 50 mm Backset

□ Sample Narratives:

- "HEAD RESTRAINTS ARE VERY UNCOMFORTABLE FOR A PERSON UNDER 5 FOOT 4. TILTS HEAD FORWARD IN AWKWARD POSITION.
- HEADRESTS SET TOO FAR FORWARD. AGGREGATED/PINCHED NERVE IN NECK REQUIRING PHYSICAL THERAPY TO MINIMIZE PAIN/DISCOMFORT. NEED TO REMOVE HEADRESTS.
- HEADREST IS TOO FAR FORWARD. WE HAVE TO BEND OUR NECK FORWARD, AS WE CAN'T SIT STRAIGHT UP IN THE SEAT. I'M 5'8" & MY HUSBAND IS 6'. VERY BOTHERSOME AND I WISH I'D HAVE NOTICED ON OUR TEST DRIVE, I REALLY WOULD HAVE THOUGHT TWICE ABOUT PURCHASE.
- HEADREST TOO FORWARD, UNCOMFORTABLE DURING LONG TRIPS.
- HEADREST BOTHERS HAIR
- VERY POOR-DOESN'T ALLOW ME TO SIT TALL W/GOOD SPINAL POSTURE-HITS BACK OF HEAD WHEN I TRY TO SIT TALL. IT'S NOT ADJUSTABLE, I REMOVED AND REINSERTED IT FACING 180 DEGS FROM ITS INTENDED POSITION."

Customer Complaint Data

50 mm Backset vs. 70 mm Backset



Customer Complaint Data

50 mm Backset vs. 70 mm Backset

□ 2005 MY LX Model

- 50 mm NPRM Backset Requirement
- QTS Data
- 9332 Responses
- 345 complaints
- 3.70 c/100
- 71% for head restraint too close to head
- 2.62 c/100 for backset

□ 2006 MY LX Model

- 70 mm IIHS "good" requirement
- QTS Data
- 3436 Responses
- 42 complaints
- 1.22 c/100
- 50% for head restraint too close to head
- 0.61 c/100 for backset
- **Backset Complaints Reduced ~75% from '05 MY.**

Backset and Comfort Study

Head Restraint Backset Study

□ Purpose:

Determine the optimal target (CAD) value of backset that:

- - ensures compliance with FMVSS-202a and
- - minimizes the percentage of drivers who experience comfort problems caused by the head restraint position.

Head Restraint Backset Study Process

- This study consists of two elements:

Study #1: Backset “manufacturing variability” study

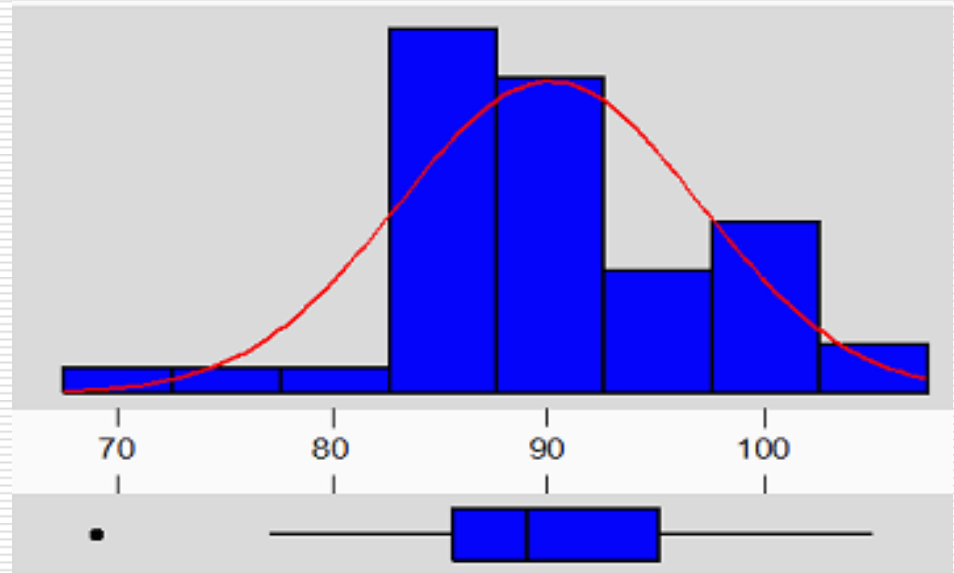
Backsets were measured at assembly plants per 202a procedure in 40-45 production seats for each of 3 different vehicle models to determine the variability (3 standard deviations, and a “mean-shift” (a difference between actual average backset vs. backset “target” from CAD).

Study #2: Drive evaluation to determine the smallest backsets (readings in the 202a standard test) acceptable to 50 drivers, each evaluating same 3 vehicles. Drivers represented a wide range of ages, heights and weights.

Backset Variation due to Build Variability

- 45 Lincoln TownCars MY 2005 measured with a single operator and gauge.

	Backset at full-up position (mm)	Torso angle (deg)
Sigma	7.0	
3 sigma	21.0	
Mean	90.4	25.0
Max	105.0	25.9
Min	69.0	24.0
Range	36.0	1.9



Head Restraint Study: Backset vs. Manufacturing Variability

□ Manufacturing variability

- Mean backset can differ significantly from design due to piece to piece variability

Vehicle Model	Mean Backset (mm)	Backset in CAD (mm)	Mean Shift (mm)	3 sigma (mm)
A	53.7	70	-16.3	19.5
B	56.8	60	-3.2	21.6
C	32.1	60	-27.9	16.2

Drive Evaluation

- **Purpose**: Determine the backset at the most forward position of HR that is acceptable to each driver.
- **Steps**:
 - **1.** Fabricate 3 fore-aft adjustable head restraints (1 per each vehicle) that were adjustable in the fore/aft direction and installed them into vehicles: a sport car, small SUV and medium SUV.
 - **2.** Perform the 202a backset measurement test with HRMD to calibrate each adjustable head restraint to read backset at 25° torso angle directly.
 - **3.** Perform a drive evaluation with 50 drivers (25 females and 25 males). Each driver evaluated all 3 vehicles. No pony tails or hair clips were allowed. Hair thickness ranged from 0 to 60mm. Driver adjusted seat to a most comfortable position when HR was at “full rear” position. HR was then adjusted to a most forward position that was acceptable to the driver. Recorded the backset reading from the HR scale. Repeated the cycle of driving and adjusting the seat and HR. Recorded the “final backset” reading from the scale.
 - **4.** Analyzed the “final backset” data to determine the mean and standard deviation (sigma) values for each vehicle.

Drive Evaluation



202a Backset Test with HRMD, at 25 deg torso angle.

Backset readings 0-100mm were marked on the scale of adjustable HR.

Step 2



Drive Evaluation.

**Driver adjusted seat.
HR was adjusted as far forward as driver could tolerate.**

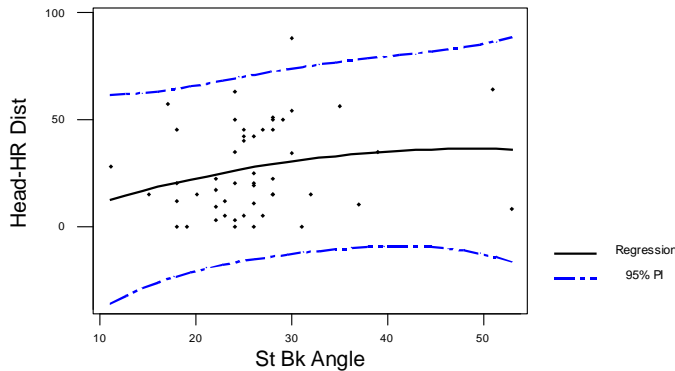
Recorded the Final Backset from the scale.

Step 3

Drive Evaluation Comfort Study: Raw Data Minimum Head to Head Restraint Distance

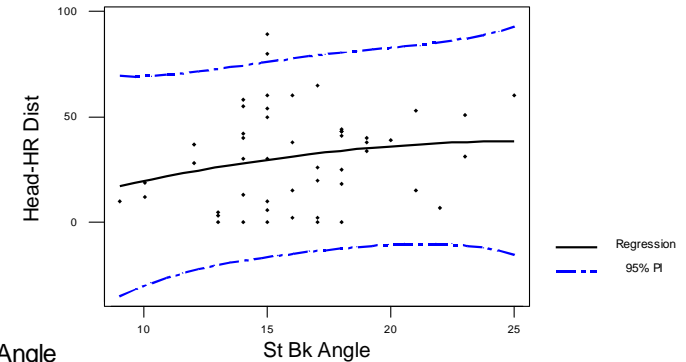
Head-to-HR Distance vs. Seat Back Angle

Veh. 1 - Sport Car



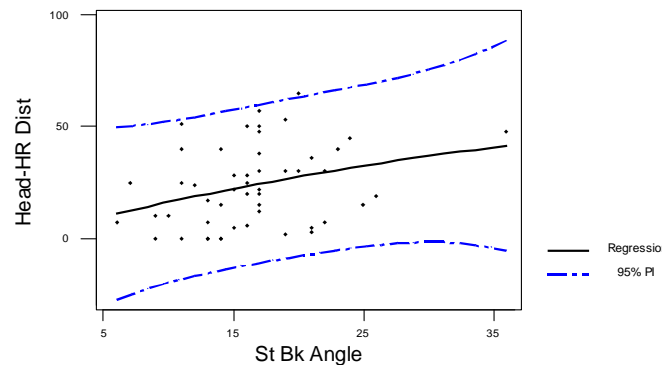
Head-to-HR Distance vs. Seat Back Angle

Veh. 2 - Small SUV



Head-to-HR Distance vs. Seat Back Angle

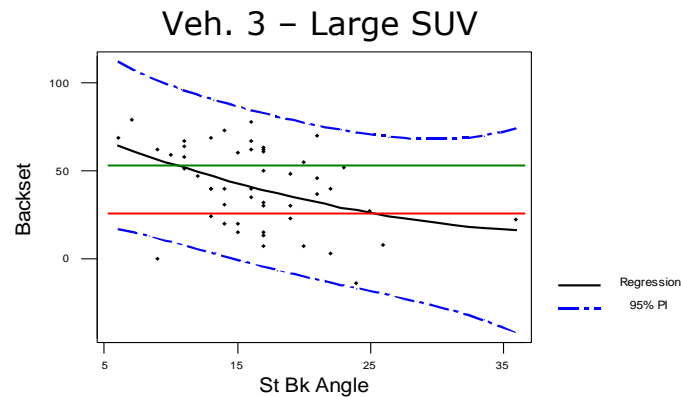
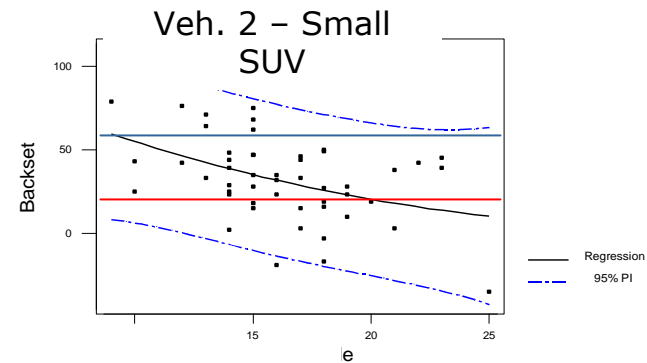
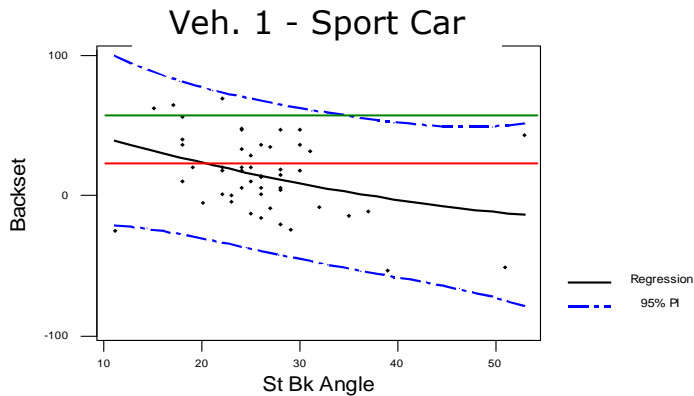
Veh. 3 - Large SUV



Note the
range of
seat back
angles

Nobody
chooses
negative
clearance

Driver Evaluation Comfort Study: Backset vs. Seat Back Angle, Data Normalized to FMVSS 202a Backset



Green Line is
202a
Requirement

Red line is
compliance
margin design
line

Points above the
red lines would
be dissatisfied
drivers.

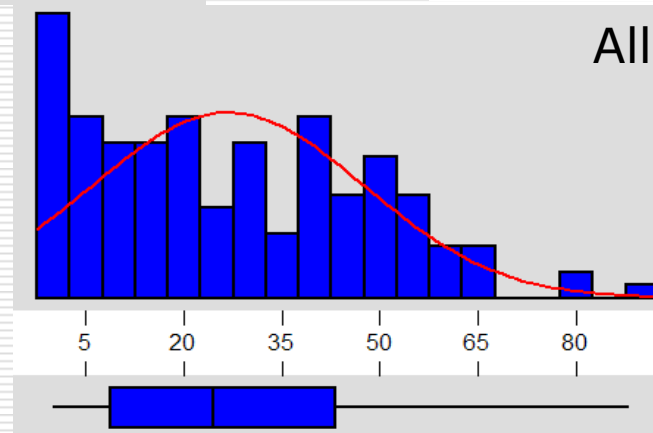
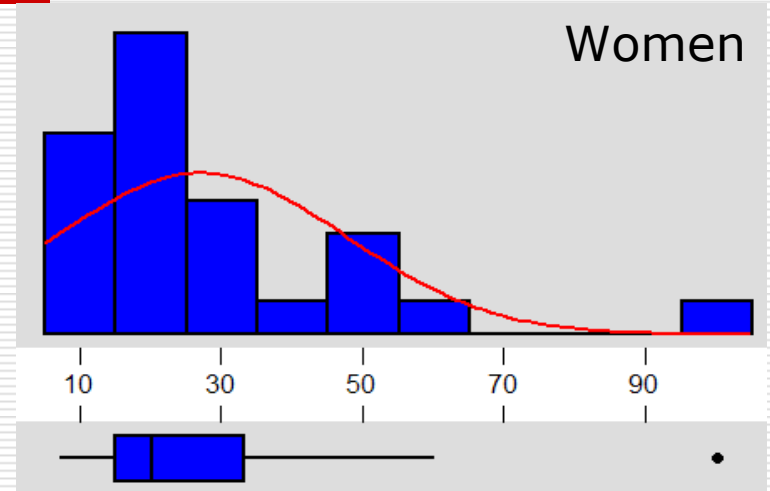
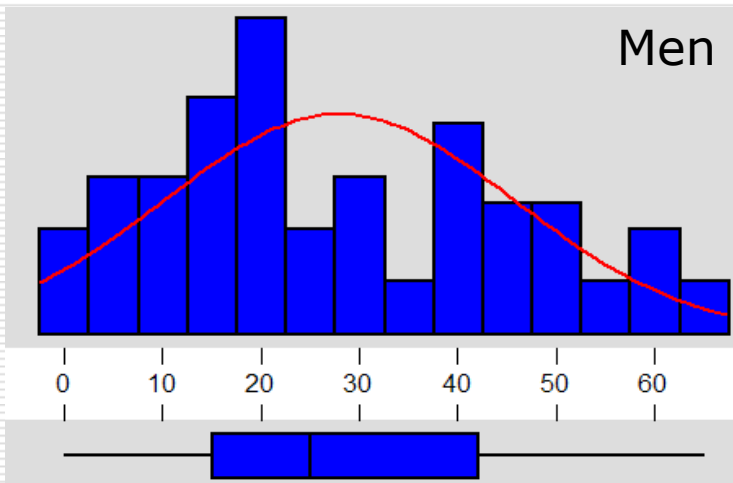
Aggregate Head Clearance Data

Driver's hair thickness measured at back of head

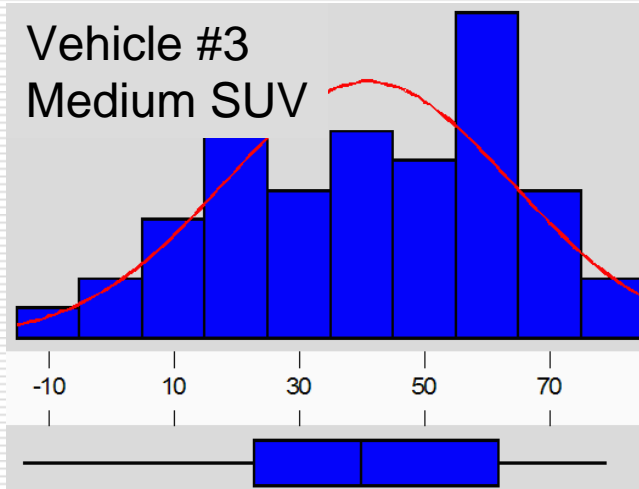
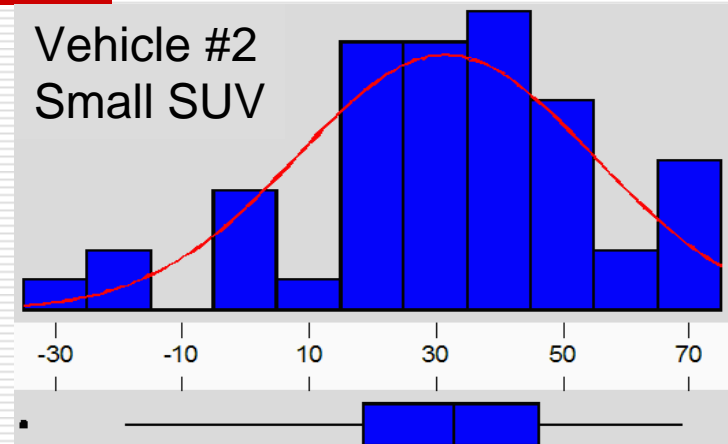
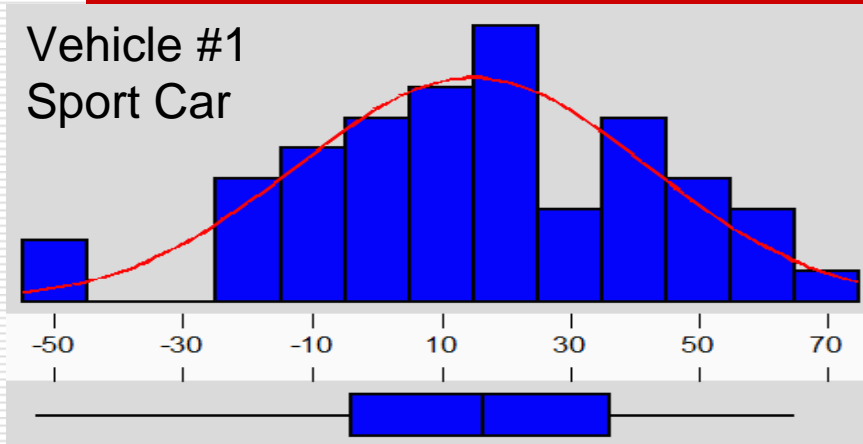
and Head to HR distance @ most forward acceptable position of HR

	Hair thickness		HR to Head Distance		
	Men	Women	Men	Women	All
Mean	11.96	27.12	27.96	25.6	26.78
Min	0	7	0	0	0
Max	60	100	65	88	88
Range	60	93	65	88	88
Sigma	11.3	20.7	17.9	23.5	20.8

Minimum Distance (mm): H/R to Head

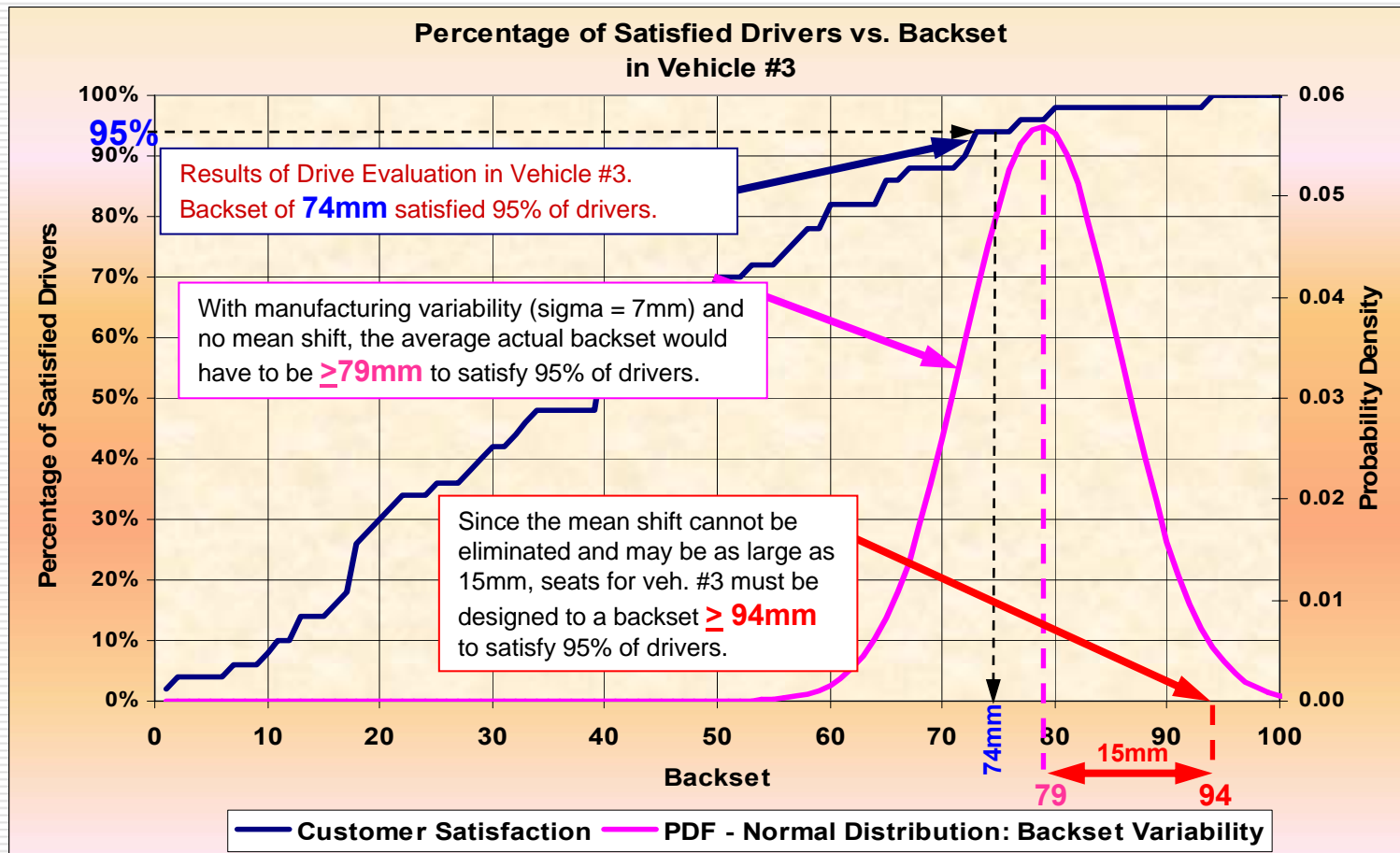


Smallest "backset" acceptable to drivers.



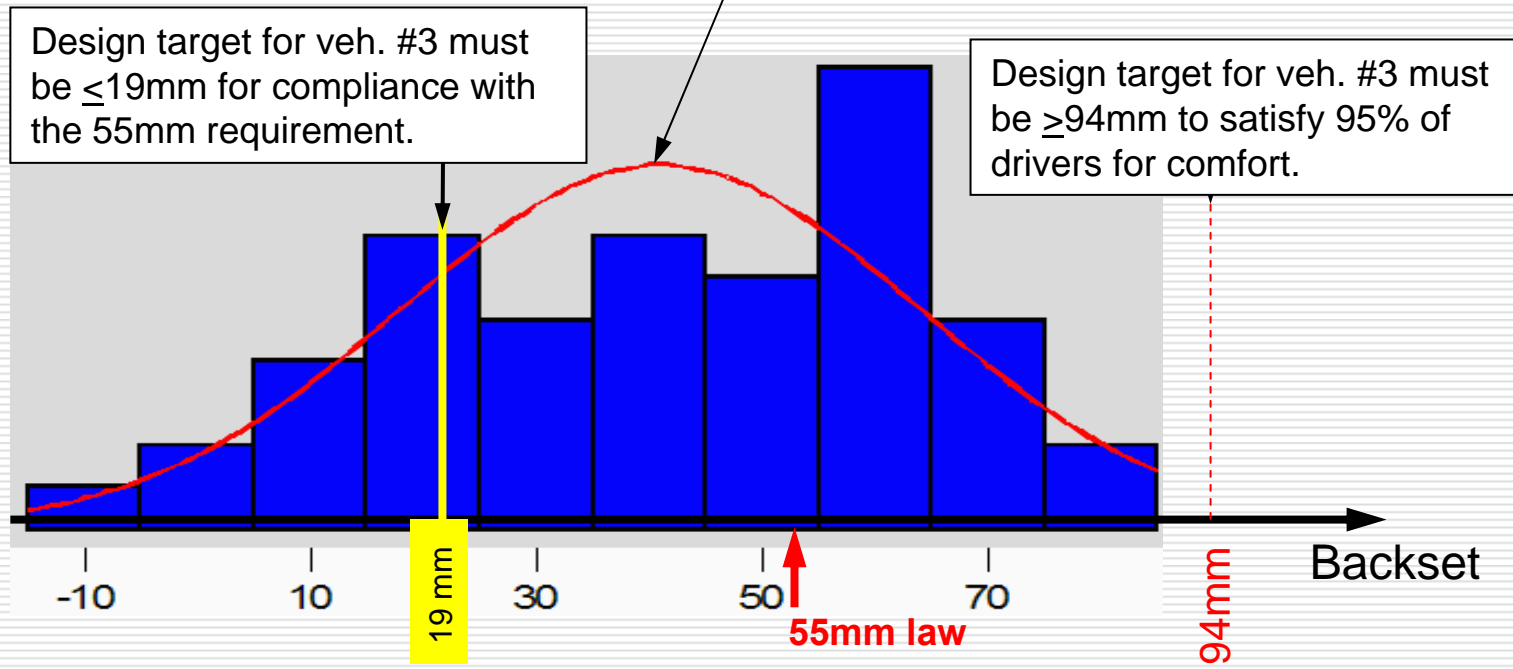
Vehicle	% of drives who required backset greater or equal to:		
	55mm	40mm	35mm
1. Sport Car	8%	20%	28%
2. Small SUV	20%	38%	48%
3. Medium SUV	36%	58%	62%

Drive Evaluation: Smallest acceptable backset in Vehicle #3



Conclusions from Studies #1 and 2

Distribution of smallest acceptable backsets from Study #1, Vehicle #3



Conclusions & Recommendations

□ Conclusion:

- **It is not possible to design a seat and head restraint that is both (a) statistically compliant with the 55mm requirement and (b) comfortable to 95% of drivers.**

□ Recommendation:

- Head restraints that adjust in the fore/aft direction could be a solution to the comfort problem if the 55mm requirement applied to the MOST FORWARD position of head restraint. Adjustable head restraints are preferred by drivers because they can be adjusted to a comfortable position that is close to driver's head.

Head Restraint Study: Backset vs. Comfort & Production Variability

□ Conclusions:

■ Customer Comfort:

The FMVSS-202a backset target (CAD value) would have to be at least 94 in order to satisfy 95% of drivers for vehicle model #3 (large SUV), according to the results of this study.

■ Production Variability:

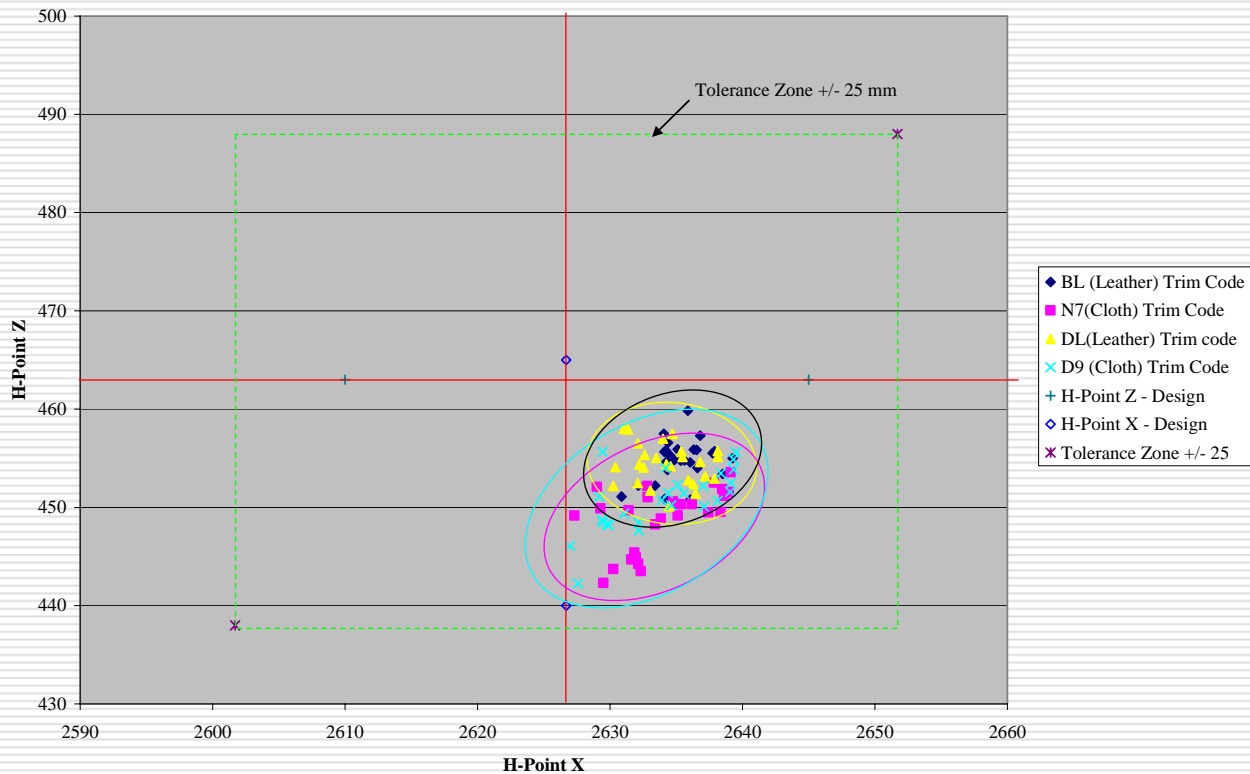
Based on the backset data gathered in assembly plants and on estimates of possible reductions of variability, the design target for backset must be approx. 19 mm or less to ensure statistical compliance of vehicles with the 55 mm requirement.

■ It is not possible to design a seat that is both:

1. comfortable for at least 95% of drivers and
2. statistically compliant with the existing 55 mm requirement from a production variability standpoint.

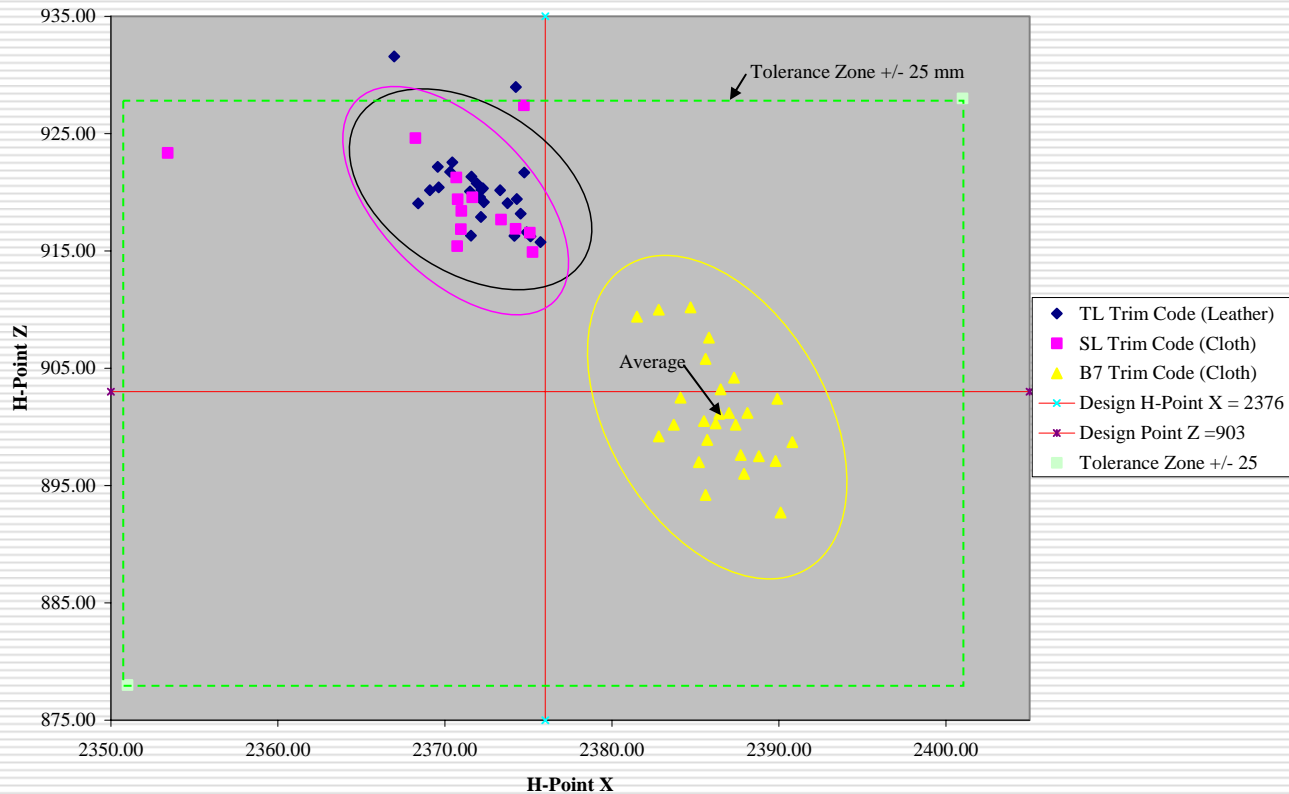
Production "H" Point Data: Audit data from seat suppliers

2005 Chrysler Sebring Convertible H-Point Audit Data (Driver)



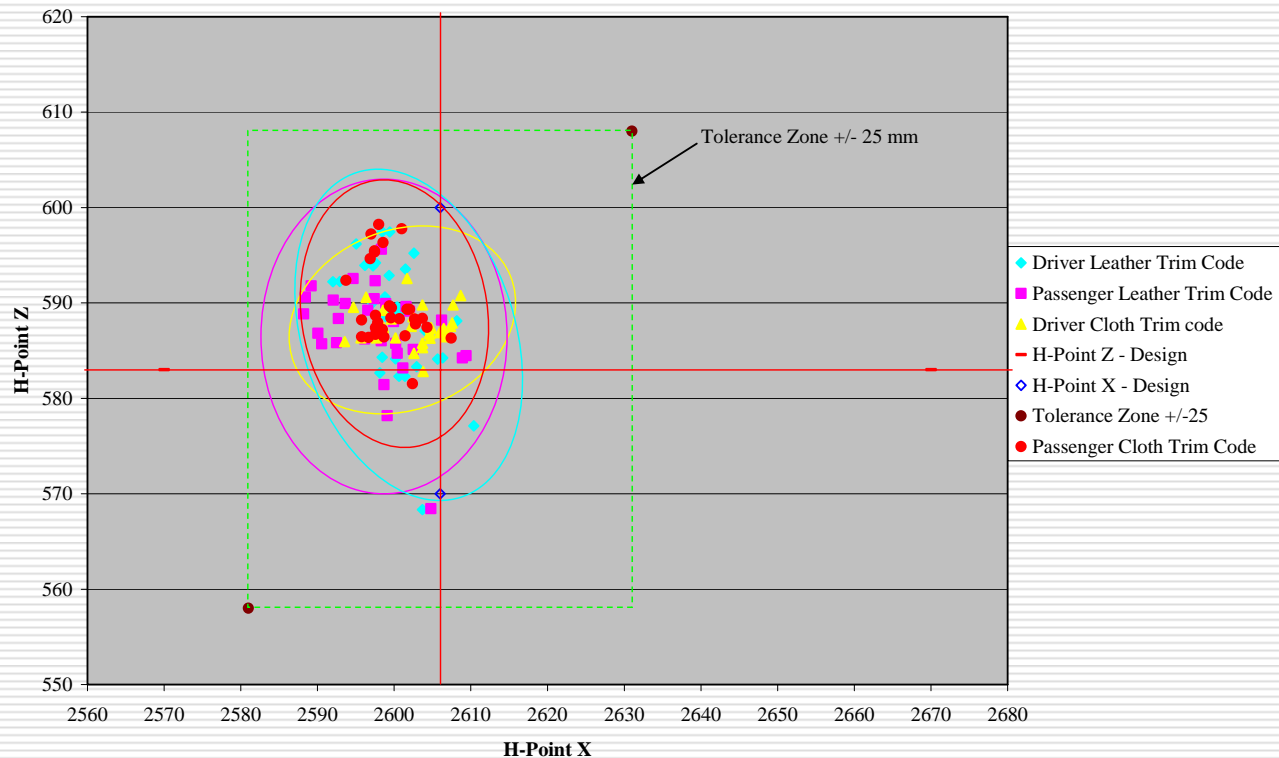
Production "H" Point Data: Audit data from seat suppliers

2005 Dodge Caravan Minivan H-Point Audit Data



Production "H" Point Data: Audit data from seat suppliers

2005 Chrysler PT Cruiser Front Seat H-Point Audit Data



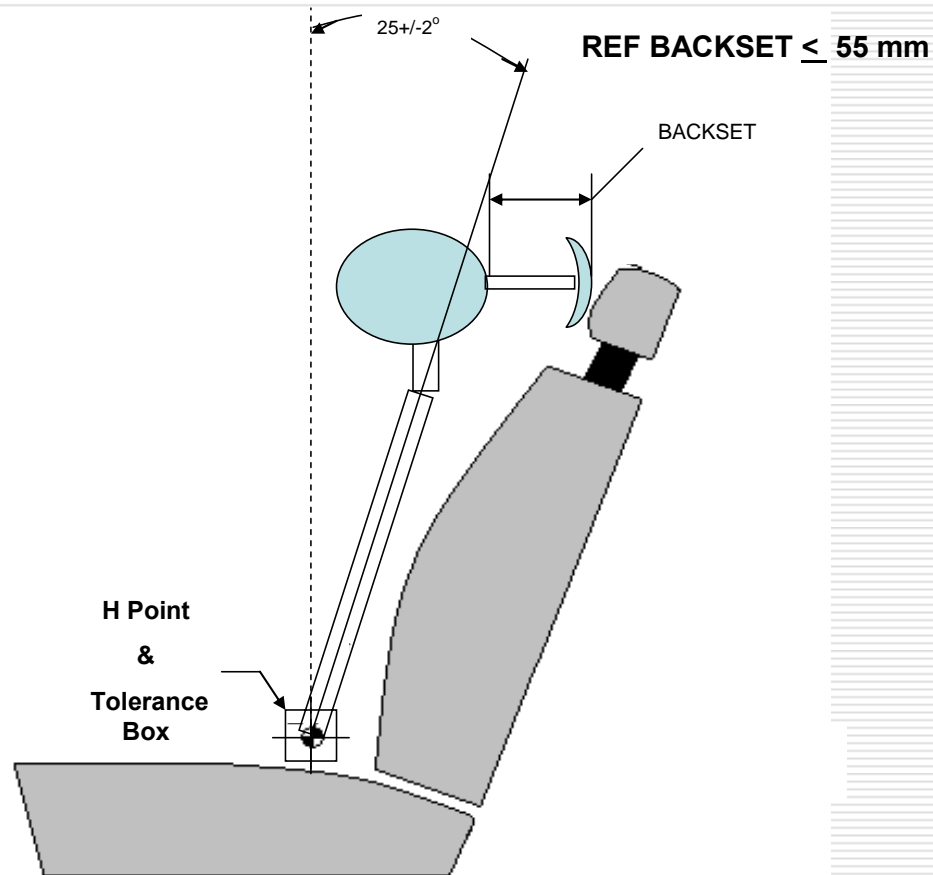
Backset Change with Torso Angle

- 4-5 mm per degree
- Torso angle change from 25° to 15° results in 40-50 mm reduction in backset
 - Occupants who sit more upright may have smaller than 55mm backsets or even interference.

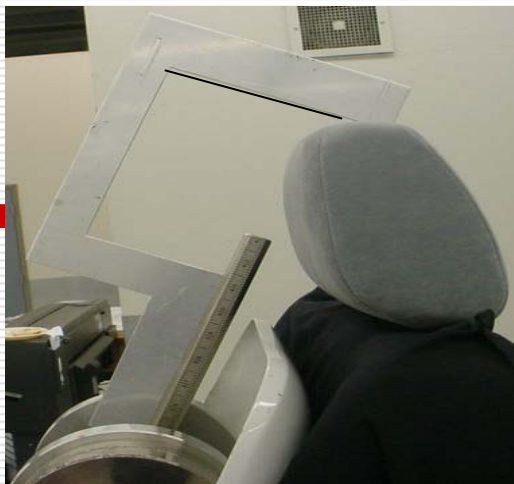
"H" Point Variability Directly Affects Backset

- ❑ State of the art seat manufacturing has a 20-50 mm range in "H" point position due to seat structure, foam and trim tolerance variation and configuration (content) differences
- ❑ ECE R17 permits a +/- 25 mm "H" point tolerance about "R" point
- ❑ Head restraint height and backset are affected at least 1:1

"H" Point & Back Angle Variability Affect on Backset



Impact of H-pt/Back Angle Variability on Head Restraint Height and Backset Measurements in CAD



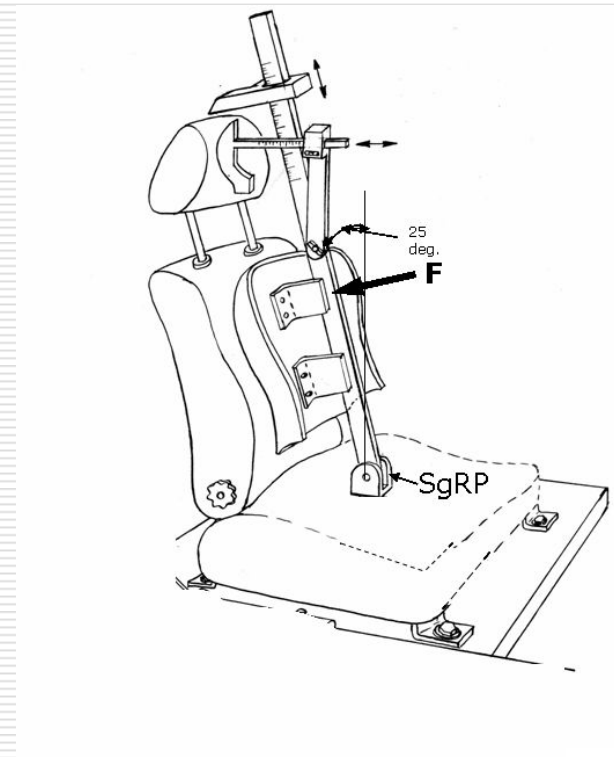
	Range of HR height in CAD (mm)		Range of backset in CAD (mm)	
Torso Angle	For +/-15mm tolerance of H-pt	For +/-25mm tolerance of H-pt	For +/-15mm tolerance of H-pt	For +/-25mm tolerance of H-pt
23 deg	780.3-819.7mm	767.2-832.8mm	56.1-86.1mm	46.1-96.1 mm
25 deg	780.1-819.9mm	766.8-833.2mm	40 - 70mm	30-80 mm
27 deg	779.8-820.2mm	766.4-833.6mm	24.2-54.2mm	14.2-64.2mm

Alliance/MGA Backset Measurement Study: Test Setups

- TP-202a w/ "H" point at design seat back angle

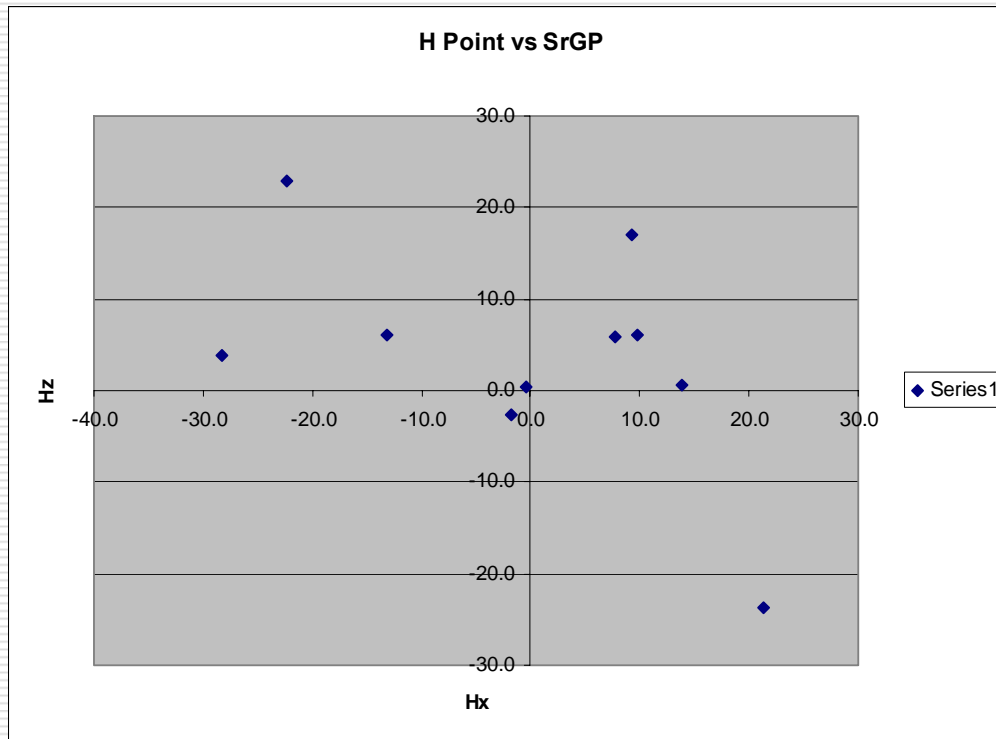


- "R" point method at design torso angle



Alliance/MGA Backset Measurement Study: Phase 1 Test Results & Conclusions

- Using TP-202a, we validated that “H” points and “R” points are different.



Alliance/MGA Backset Measurement Study: Phase 1 Test Results & Conclusions

- The two methods produce significantly different average of 4 backset measurements.

	Backset (202a)	Backset SgRP	Backset H vs R
Ford Focus	37.3	20.8	16.5
Ford Explorer	58.0	48.5	9.5
GM Hummer H3	41.8	47.1	-5.3
Toyota Camry Cloth	47.3	24.8	22.5
Toyota Camry Leather	47.3	17.6	29.8
Chevy Trail Blazer	86.0	66.3	19.8
Dodge Caravan Cloth	52.8	20.3	32.5
Dodge Caravan Leather	57.8	28.8	29.0
Chrysler 300	87.0	112.3	-25.3
VW Jetta	41.8	22.8	19.0

Alliance/MGA Backset Measurement Phase 2 Study: Test Results & Conclusions

- Reconcile variability in R point data in phase 1
 - With equivalent measurement accuracy tools, R point method, has slightly better repeatability. Both methods have acceptable repeatability.
 - Backset differences were replicated.
 - Backpan force variation in R point method was replicated in phase 2

Alliance/MGA Backset Measurement Phase 3 Study: Test Setup



Trail Blazer



300C

Backpan weights
For equivalent
Moment to HRMD



Note: Backpan is
farther away from
300C seat at top
than Trail Blazer

Alliance/MGA Backset Measurement Phase 3 Study: Test Results & Conclusions

- ❑ Eliminate backpan force differences as cause for backset differences.
- ❑ Fix seat back angle in design position and measure backset by both methods and with equivalent backpan moments.
- ❑ Backpan interaction with seat lumbar significantly affects backset.

		Chrysler 300		Trail Blazer	
		H	R	H	R
Phase 1	Backset	87	112.3	86	66.3
	Hx vs Rx	-1.8	0	-0.4	0
	Hz vs Rz	-2.8	0	0.4	0
	Torso angle	28.2	24	23	23
Phase 3	Backset	58.8	61.4	76.8	59.3
	Hx vs Rx	-7.2	0.6	-5	0.6
	Hz vs Rz	11	0.4	11.7	0.4
	Torso angle	24.6	19.4	22.9	20.9
	Seat back angle Δ	0.4	0.3	0.6	0.4

MGA Study Conclusions

- ❑ “H” point method requires compliance margin for backset bias and variability.
- ❑ “R” point with equivalent backforce has not eliminated all the manufacturing and measurement variability
- ❑ Certifying the seat and head restraint as in ECE R17, including backset, makes the most sense, and is a proven accepted procedure.

Backset, Variability & Benefits Issues

- ❑ Published backset in 202a (55mm at 25° torso angle) will create unacceptable levels of customer dissatisfaction.
- ❑ Customer experience with a nominal 50 mm design backset has been unacceptable
- ❑ Tier I Seat Suppliers advise: to meet 55 mm at 25° measuring from “H” Point will require head restraints with a “nominal” design of ≤ 25 mm.
- ❑ Expect head interference at 18-20° torso angle with 4-5 mm backset change/deg of torso angle.

Dynamic Test Option

Dynamic Test Option

- ❑ Development of active head restraints are hindered due to injury criteria and lack of a test procedure along with accurate instrumentation
- ❑ 12° head-torso rotation limit will eliminate some reactive head restraint systems with “Good” performance from the market
- ❑ Provision needed in test procedure for alternate deployment methods such as “trigger points” since the half sine pulse is not the same as a rear impact.

Issues With Dynamic Test for Head Restraints

- Dynamic requirements in 202a are more severe than static requirements for passive head restraints.
- Dynamic requirements in 202a are currently unachievable for reactive head restraints and will cause the deletion of some reactive head restraints
 - Volvo V70 with “WHIPS” passes static test but not FMVSS 202a dynamic test.

Volvo “WHIPS” Seat: Real World Performance & Public Ratings

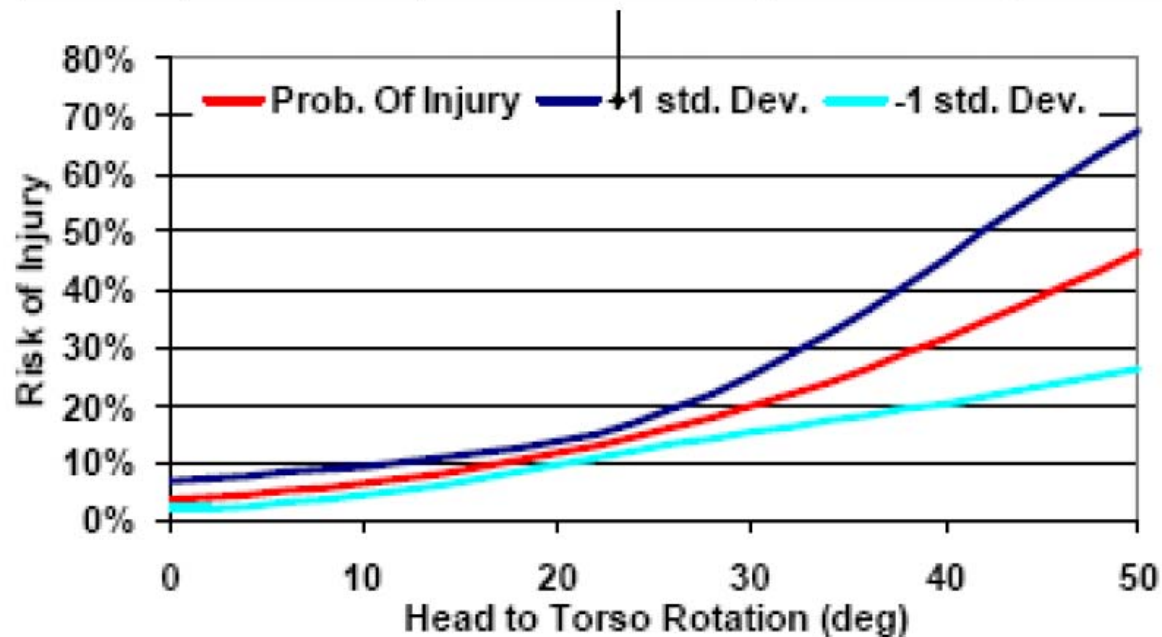
- ❑ IIHS (10/2002): 49% reduction in neck injury claim rates compared to previous generation seats.
- ❑ IIHS/IIWPG (2005): All Volvo models tested (S40, S60, S80, XC90) were rated “good”.
- ❑ Folksam/SRA (2005): All Volvo models tested (S40, V50, S60, V70, S80, XC90) were rated “good”.

Dynamic Test Option: 12 Degree Injury Criterion

- Based on one type of seat: with SAHR(Saab 9-3) and without SAHR (Saab 9000)
 - At 16 km/hr ΔV (approximates Dynamic Test Alternative ΔV of 17.3 km/hr)
 - Two tests with Saab 9-3 (SAHR)
 - Two tests with Saab 9000 (w/o SAHR)
 - Head-to-Torso rotation obtained through a different method (film analysis) than that specified by FMVSS 202a
- 12 Degree injury criterion may not accurately represent other head restraints/ seats (including other active systems)

Dynamic Test Option: Head-to-Torso Rotation Risk Curve

Seat	Field Data		Sled Tests (16 km/h) weighted	
	No. of occupants	No. with MT and LT whiplash injuries	Head to torso rotation (deg)	Head to torso x-translation (mm)
Saab 900	160	25	25.5	37
Saab 9-3	122	9	12.1	13



20° Head-torso rotation is equivalent to 11% injury risk

Non-Use Positions

Non-use Positions

- Many current and future vehicles (e.g. Caravan, Avalanche, Freestyle, M-Class) are at risk of losing a strong customer appeal feature (fold and tumble or stowable seats) since their non-use options are not permitted by FMVSS 202a.

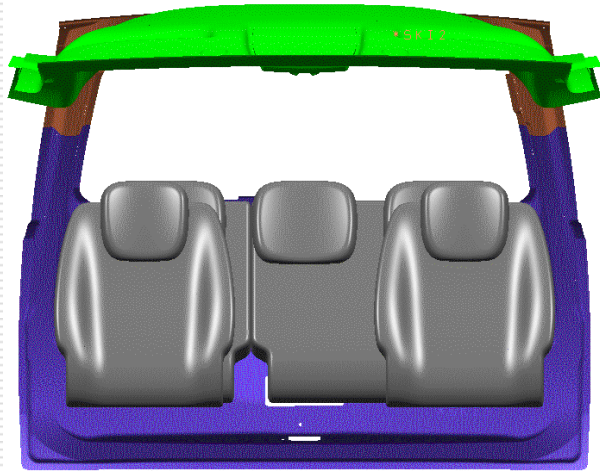
Non-use Position Issues

- ❑ “+/- 60° rotation” and “automatic return” options in final rule may not work for “fold flat” and “stowed” seat designs
- ❑ Non-use positions are important for rearward visibility
- ❑ Removable head restraints will be removed and may not be available when wanted
- ❑ Alliance urges NHTSA to permit all of the non-use alternatives proposed within the GTR draft text

Alliance urges NHTSA to permit these additional alternatives:

- 10° torso angle change between in use and non-use positions
- Warning label
- "Discomfort metric"

Visibility Benefits of “Shingled” Rear [2nd and 3rd row] Head Restraints

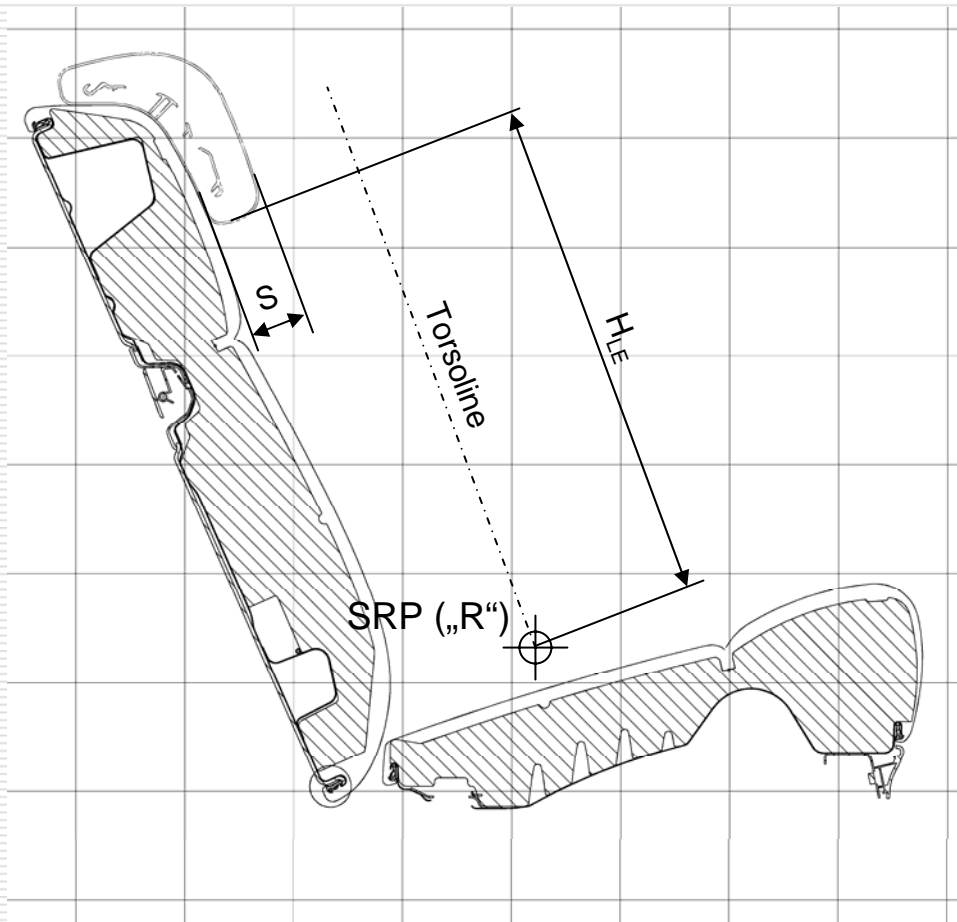


Non-use Position Alternative: Warning Label



**Warning label coupled
with owner's manual
verbiage to educate
occupant as to correct
head restraint positioning**

Non-use Position Alternative: “Discomfort Metric”



Definition of lower edge of head restraint in non-use position:

$450 \text{ mm} \geq H_{LE} \geq 250 \text{ mm}$
and
 $S \geq 55 \text{ mm}$

Maximum height (400 mm) needed to get discomfort even for small people.

Minimum height (250 mm) needed to prevent misinterpretation of non-use position as upright seating position (Honda petition).

Non-use Position: 400x25 mm “Discomfort Metric” 2005 MY Chrysler Stow ‘n’ Go Minivan Complaint Narratives

- ❑ “VERY UNCOMFORTABLE TO SIT IN THE SEATS W/THE HEADREST ALL THE WAY DOWN.
- ❑ MIDDLE AND REAR MUST BE RAISED FOR OCCUPANT COMFORT, BUT THEN LOWERED TO BE STOWED
- ❑ THE SEATS BACKS ARE SO LOW THAT ANY ADULT SITTING THERE MUST ADJUST THE HEADREST SO IT'S NOT IN THEIR BACK.
- ❑ THEY HIT MY BACK AWKWARDLY UNLESS I MOVE THEM TO AN EXTENDED POSITION.
- ❑ WITH HEADRESTS IN DOWN POSITION, IT IS VERY UNCOMFORTABLE, AS THEY HIT YOU IN THE LOWER NECK AND IN THE RAISED POSITION THEY ARE IN DRIVER'S VIEW (WHEN NO PASSENGERS ARE PRESENT).”

Discomfort Metric Study Data

- 103 Adults participated
 - 55 small, 38 medium and 10 large
- Rode in second row of minivans evaluating eight (8) H_{LE} vs S combination head restraints
 - (350, 400, 450 & 500mm x 29 & 58mm)

H_{LE} vs S Discomfort Metric Study

Sitting Height and Size Grouping

Percentile	Adults (mm)	Adults (in)
5	813	32.0
10	828	32.6
15	838	33.0
20	848	33.4
25	855	33.7
30	863	34.0
35	869	34.2
40	876	34.5
45	883	34.8
50	889	35.0
55	895	35.2
60	903	35.6
65	910	35.8
70	918	36.1
75	925	36.4
80	934	36.8
85	943	37.1
90	954	37.6
95	971	38.2

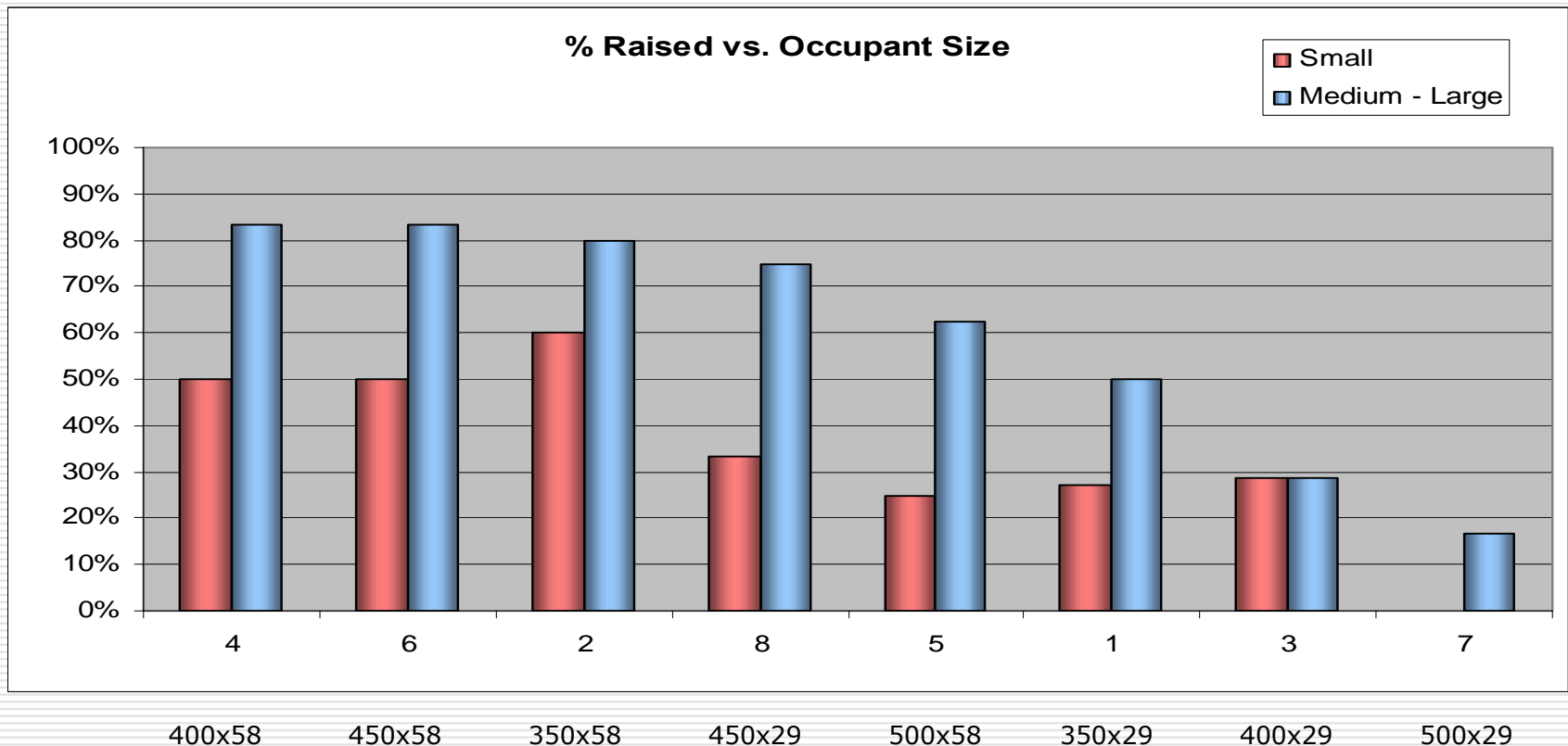
5th-25th percentile = Small

25th-75th percentile = Medium

75th-95th percentile = Large

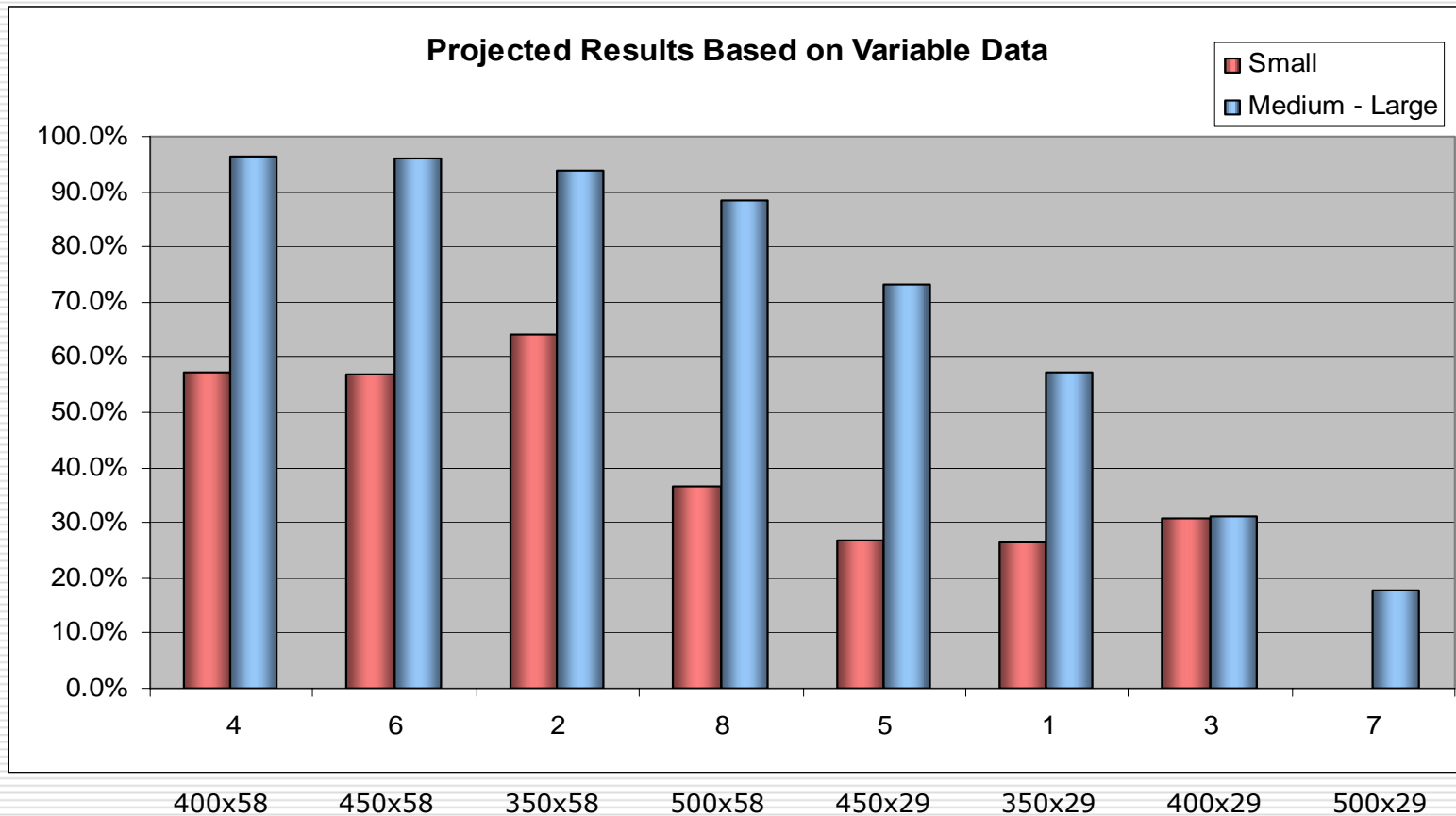
H_{LE} vs S Discomfort Metric Study

Positive reaction by occupant size



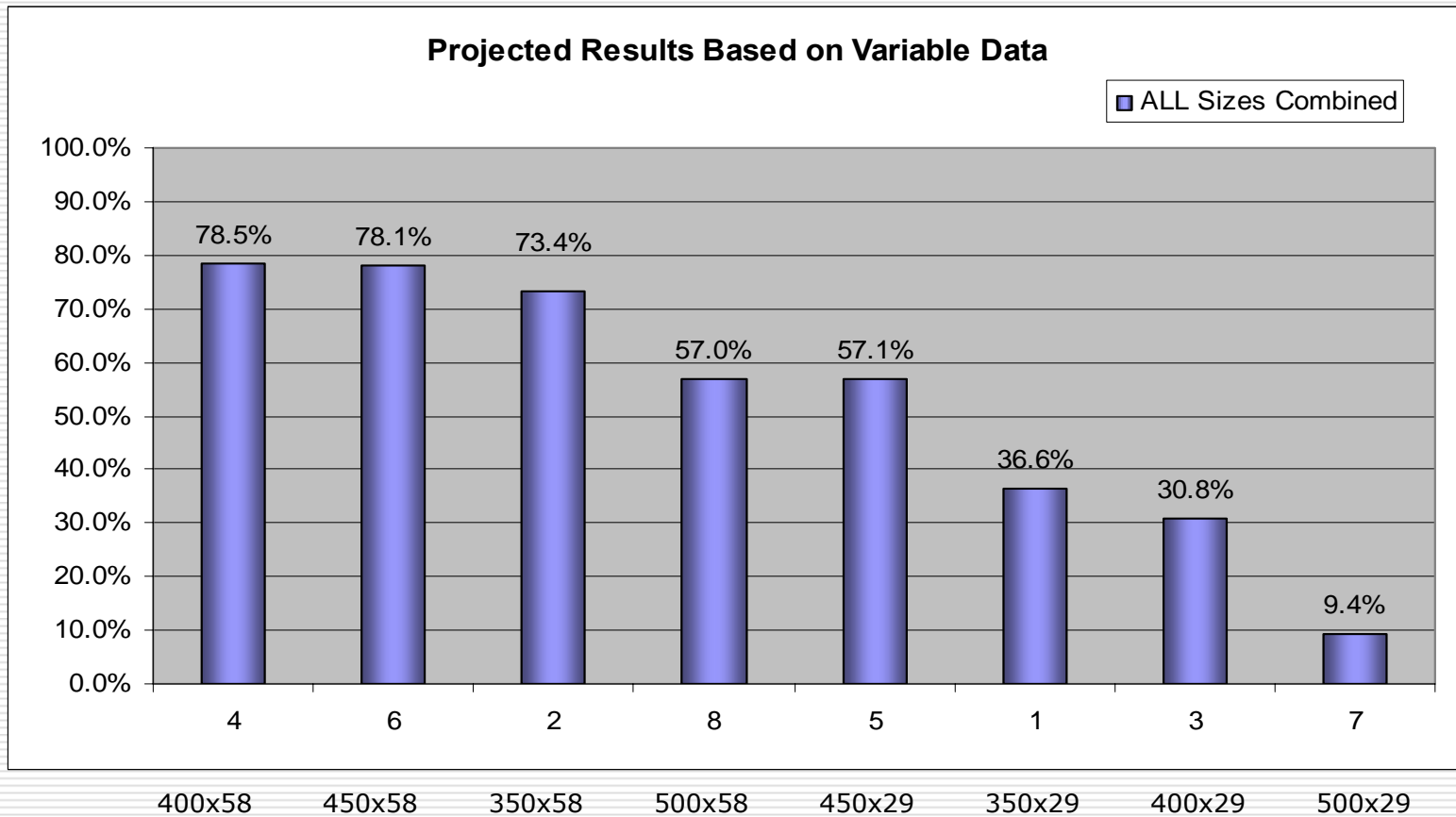
H_{LE} vs S Discomfort Metric Study

Projected Head Restraint Use



H_{LE} vs S Discomfort Metric Study

Projected Head Restraint Use



“Discomfort Metric” Human Factors Testing

- 80% positive response not yet achieved over entire occupant size range
 - Taller occupants respond better than shorter.
- S is more critical to outcome than H_{LE}
- 10° torso angle change is equivalent to 450 X 58mm, H_{LE} x S dimensions.
- Testing is terminated. Alternative designs to “shingled” head restraints are being pursued.

Backset Lock Retention Test

- ❑ Manufacturers currently offer head restraints that provide comfort features (non-locking fore-aft adjustment, side wings, inflatable pillow) to encourage occupants to maintain head restraint position while resting
- ❑ Current test requirement to “test in any position” creates more stringent backset requirement since ANY adjusted position must hold
- ❑ Current requirement will likely eliminate comfort features and may cause occupants to mis-position head restraints while resting

Recommendation

- ❑ Revise requirement to test and measure adjustable head restraints in rearmost position; **or**
- ❑ Revise requirement to test and measure adjustable head restraints in “any locked position” position