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# Vehicle Environment

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# Investigation

- Seat geometry
- Seat belt geometry
- Cushion stiffness

# Approach

- Dimensional and stiffness data of 30 modern vehicles were measured
- Good representation of vehicles
  - Range of vehicle sizes and classes
  - Popular vehicles (high sales)
  - Known problematic properties
- Assessment dynamic response
  - Not destructive
  - Suitable for testing within vehicle

# Seat stiffness

- Headform on hinged arm
  - Acceleration
    - accelerometer
  - Penetration
    - Potentiometer
  - Mass of headform 8kg
- Impact location based on R44 certification

# Cars Measured (2001-2004)

	<b>Car</b>	<b>Model Year</b>			<b>Car</b>	<b>Model Year</b>
1	Fiat Punto	2002		16	Volkswagen Golf IV	2002
2	Ford Fiesta	2002		17	Volkswagen Golf V	2004
3	Mini (BMW)	2002		18	BMW 3 Series	2002
4	Nissan Micra	2003		19	Hyundai Elantra	2002
5	Peugeot 206	2002		20	Mercedes C- Class	2004
6	Renault Clio	2002		21	Opel/Vauxhaul Vectra	2004
7	Renault Twingo	2002		22	Renault Laguna	2002
8	Vauxhall/Opel Corsa	2002		23	Mercedes E-Class	2004
9	Volkswagen Polo	2003		24	Volvo V70	2001-2004
10	Ford Focus	2002		25	Toyota Rav4	2004
11	Honda Civic	2001		26	Kia Sorento	2004
12	Peugeot 307	2002		27	Ford (Focus) C-Max	2004
13	Renault Megane	2004		28	Opel/Vauxhall Zafira	2002
14	Toyota Corolla	2003		29	Renault Espace	2004
15	Vauxhall/Opel Astra	2002		30	Renault Scenic	2002

# Stiffness results

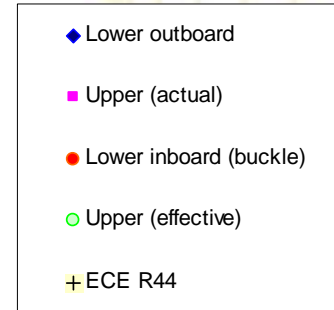
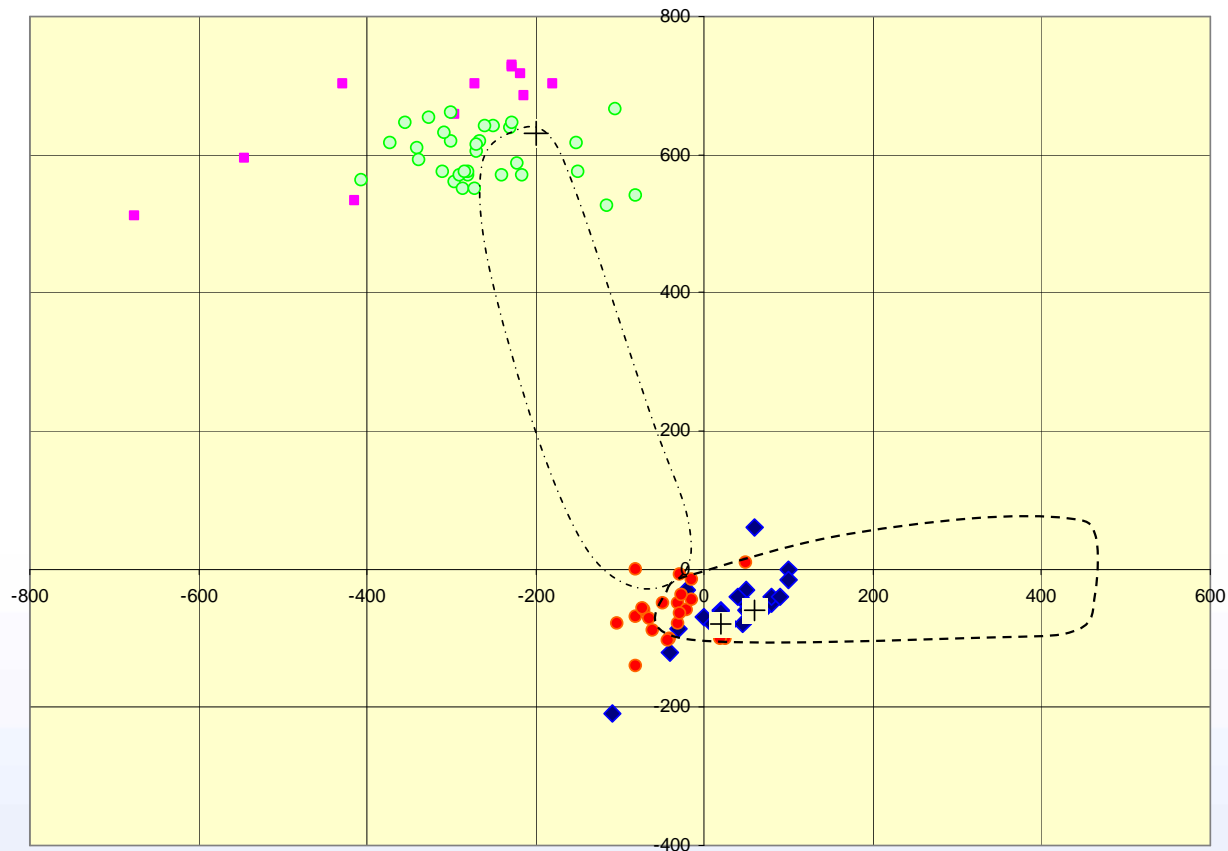
		Acceleration (g) Maximums			Acceleration (g) Maximums				
		Front Passenger	Rear Outer	3rd Row or Boot Seat		Front Passenger	Rear Outer	3rd Row or Boot Seat	
1	BMW Mini, 2002/04, 3 Door	19.52	25.06		16	VW Polo, 2003, 3 Door	20.99	17.74	
2	Peugeot 206, 2002, 3 Door	30.09	16.72		17	Vauxhall Astra, 2003, 5 Door	22.84	11.55	
3	Volvo V70, 2002, 5 Door	22.4	14.05		18	Nissan Micra, 2004, 5 Door	14.28	11.84	
4	Vauxhall Corsa, 2002, 3 Door	25.29	17.87		19	Renault Clio, 2002, 3 Door	20.51	16.51	
5	Toyota Rav-4, 2004, 5 Door	15.47	16.43		20	Renault Megane	21.34	23.84	
6	Renault Twingo, 2002, 3Door	23.2	14.61		21	Ford Focus C-Max	39.53	23.88	
7	Renault Scenic, 2002, 5 Door	12.03	8.41		22	Volkswagon Golf Mk.V, 2004, 5 Door	22.24	14.07	
8	Fiat Punto, 2002, 3 Door	23.51	16.89		23	Renault Espace, 2004, 5 Door	23.35	25.07	
9	Ford Fiesta, 2002, 3 Door	29.52	20.07		24	Mercedes-Benz C-Class, 2004, 5 Door	17.24	12	
10	BMW 318i, 2002, 4 Door	24.99	19.57		25	Volkswagon Golf Mk. IV, 2003, 3 Door	19.38	14.02	
11	Toyota Corolla, 2003, 5 Door	18.02	8.67		26	Honda Civic, 2001, 5 Door	31.7	9.35	
12	Ford Focus, 2002, 5 Door	28.92	21.3		27	Kia Sorento, 2004, 5 Door	16.22	7.28	
13	Peugeot 307, 2002, 5 Door	25.3	10.24		28	Mercedes-Benz E-Class, 2004, Estate(5 Door)	17.78	10.06	Could not m
14	Vauxhall Zaphira, 2002, 5 Door	26.88	16.93	21.04	29	R44 Test Bench	12.79		
15	Renault Laguna, 2002, 5 Door	26.29	14.91		30	Hyundai Elantra, 2002, 5 Door	14.81	10.68	
					31	Vauxhall Vectra, 2004, 5 Door	17.91	14.37	

# Test Bench cushion stiffness

- Foam samples
- Head drop tests
- Selection of foam



# Vehicle Seat Anchorage Locations



# For detailed information

- Reference Technical annexe 12 of the UK NPACS report provided by M Le Claire at the 3<sup>rd</sup> meeting, Brussels.