

Vehicle safety

Lotta Jakobsson, PhD Traffic Safety, M.Sc. Mech. Eng.
Technical Expert
Biomechanics, Injury and Accident Prevention Analysis

Volvo Cars Safety Centre
Göteborg



Volvo Safety, Volvo Cars Safety Centre, Lotta Jakobsson
Issue date: 2008-04-29
Page 1



Agenda April 29, 2008, 10-12

Introduction – Nostalgia

- Safety – Volvo philosophy
- Real safety a continuous working method
 - Accident research
 - Dummies and test facilities

Clive Alive (video)

PAUSE

Applied biomechanics

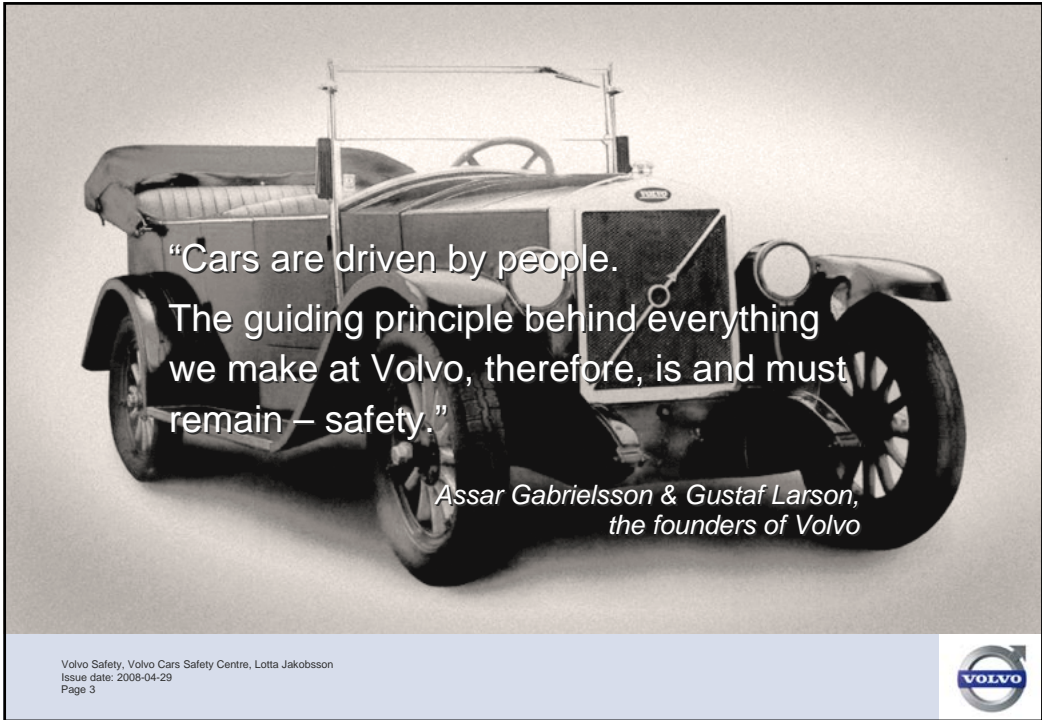
Safety system development

- Preventive safety
- Protective safety

Discussions and questions

Volvo Safety, Volvo Cars Safety Centre, Lotta Jakobsson
Issue date: 2008-04-29
Page 2





Haddon Matrix

	People	Vehicle	Environment
Before		Avoiding accidents	
During	Preventing		injuries
After	Reducing injury consequences		

Volvo Safety, Volvo Cars Safety Centre, Lotta Jakobsson
 Issue date: 2008-04-29
 Page 5



Volvo Safety, Volvo Cars Safety Centre, Lotta Jakobsson
 Issue date: 2008-04-29
 Page 6

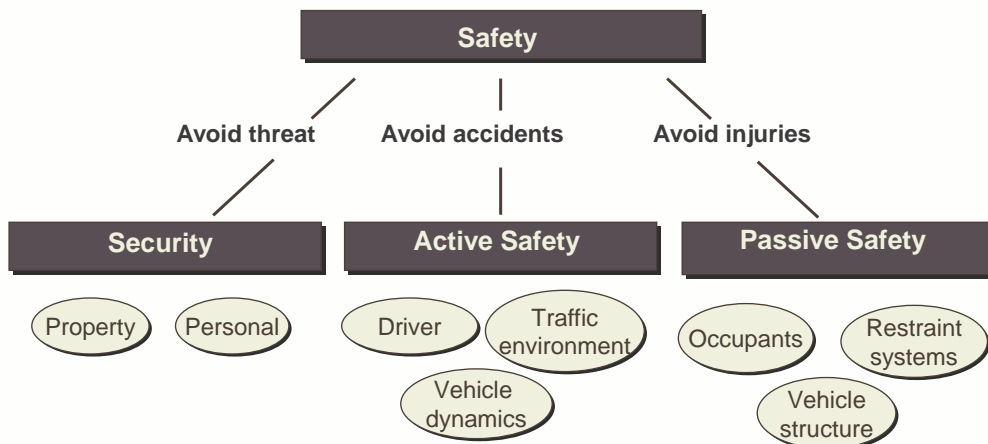




Volvo Safety, Volvo Cars Safety Centre, Lotta Jakobsson
 Issue date: 2008-04-29
 Page 7



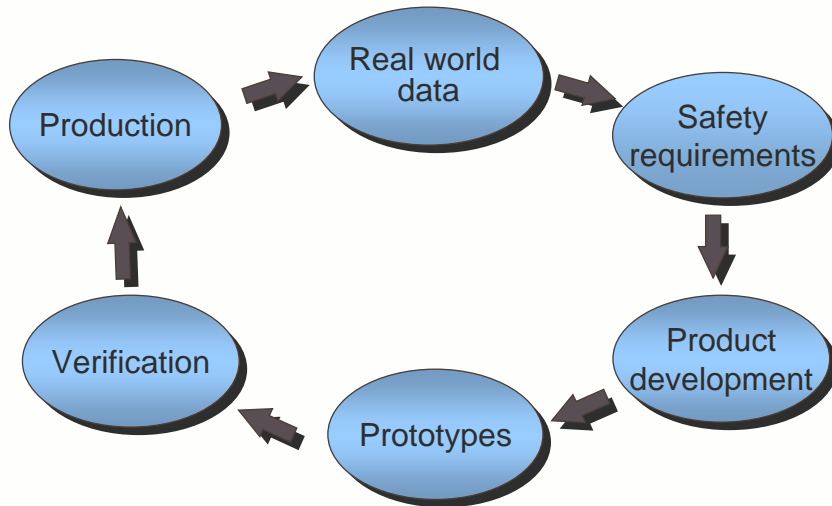
Volvo Safety Concept



Volvo Safety, Volvo Cars Safety Centre, Lotta Jakobsson
 Issue date: 2008-04-29
 Page 8



Working process 'The Circle'



Volvo Safety, Volvo Cars Safety Centre, Lotta Jakobsson
Issue date: 2008-04-29
Page 9

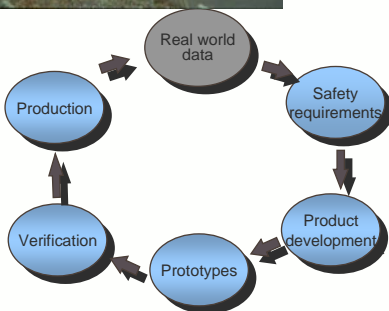


Real world data



Volvo's Traffic Accident Research Team
established 1970

- In-depth studies of accidents
- Statistical accident collection

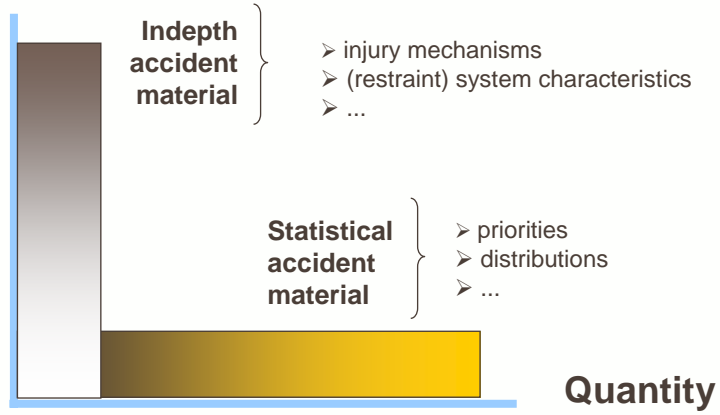


Volvo Safety, Volvo Cars Safety Centre, Lotta Jakobsson
Issue date: 2008-04-29
Page 10



Accident databases

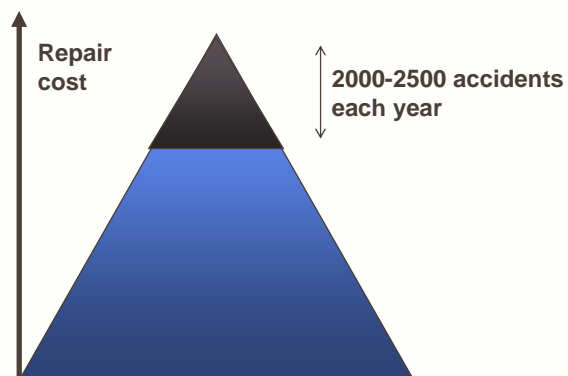
Quality



Volvo Safety, Volvo Cars Safety Centre, Lotta Jakobsson
Issue date: 2008-04-29
Page 11



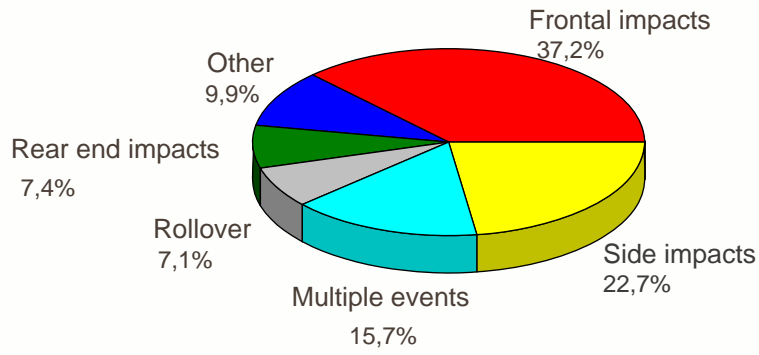
Statistical accident material



Volvo Safety, Volvo Cars Safety Centre, Lotta Jakobsson
Issue date: 2008-04-29
Page 12



Distribution of impact direction



Volvo Safety, Volvo Cars Safety Centre, Lotta Jakobsson
Issue date: 2008-04-29
Page 13



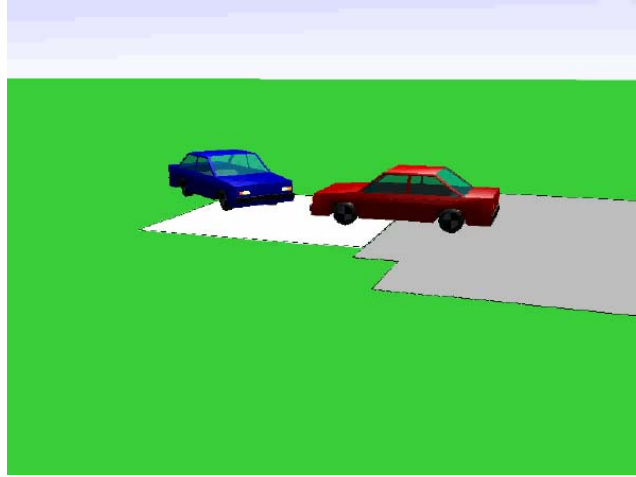
Indepth studies



Volvo Safety, Volvo Cars Safety Centre, Lotta Jakobsson
Issue date: 2008-04-29
Page 14



Accident reconstruction



Volvo Safety, Volvo Cars Safety Centre, Lotta Jakobsson
Issue date: 2008-04-29
Page 15

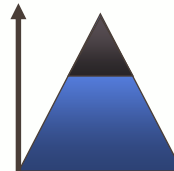


Accident databases

★ **Indepth studies**
≈ 2500 accidents

★ **Statistical database**
≈ 37 000 accidents
> 60 000 occupants
≈ 200 variables

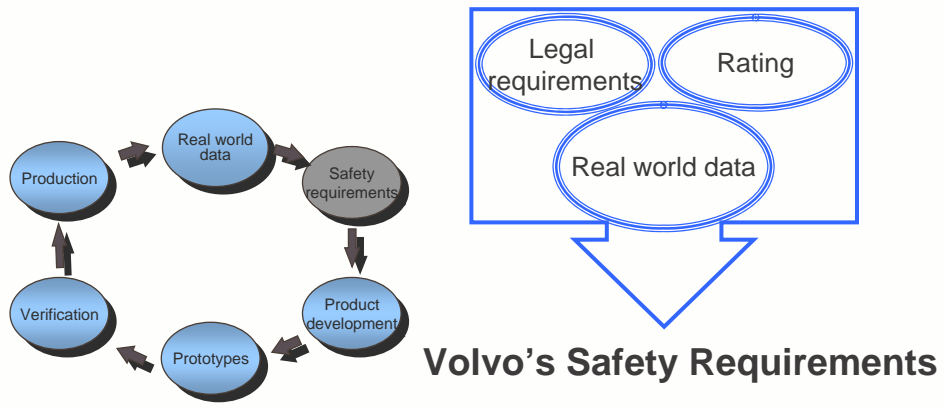
★ **External databases**
- CCIC, NASS, GIDAS



Volvo Safety, Volvo Cars Safety Centre, Lotta Jakobsson
Issue date: 2008-04-29
Page 16



Safety requirements



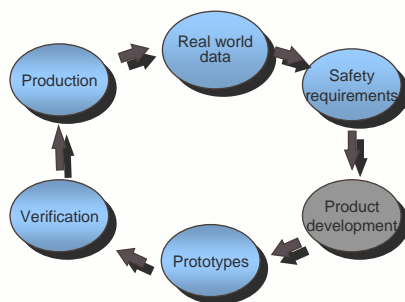
Volvo Safety, Volvo Cars Safety Centre, Lotta Jakobsson
Issue date: 2008-04-29
Page 17



Product development

Components, systems and complete designs

Mathematical simulation models

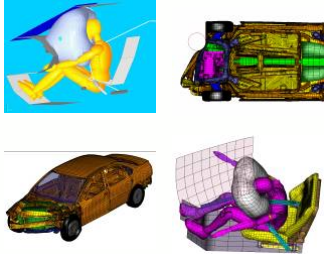


Volvo Safety, Volvo Cars Safety Centre, Lotta Jakobsson
Issue date: 2008-04-29
Page 18

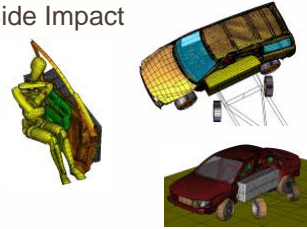


Mathematical simulation

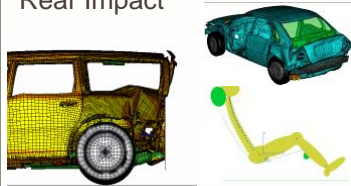
Front/Offset Crash



Side Impact



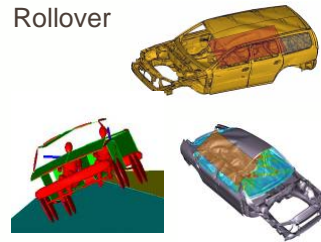
Rear Impact



Pedestrian



Rollover



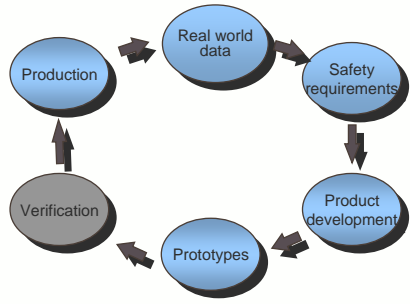
Volvo Safety, Volvo Cars Safety Centre, Lotta Jakobsson
Issue date: 2008-04-29
Page 19



Volvo Safety, Volvo Cars Safety Centre, Lotta Jakobsson
Issue date: 2008-04-29
Page 20



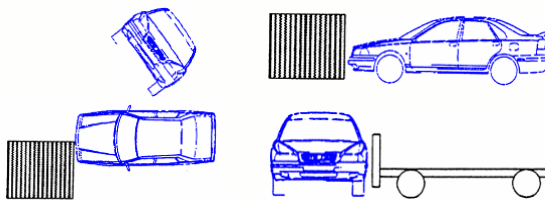
Verification



Test methods developed



Crash configurations



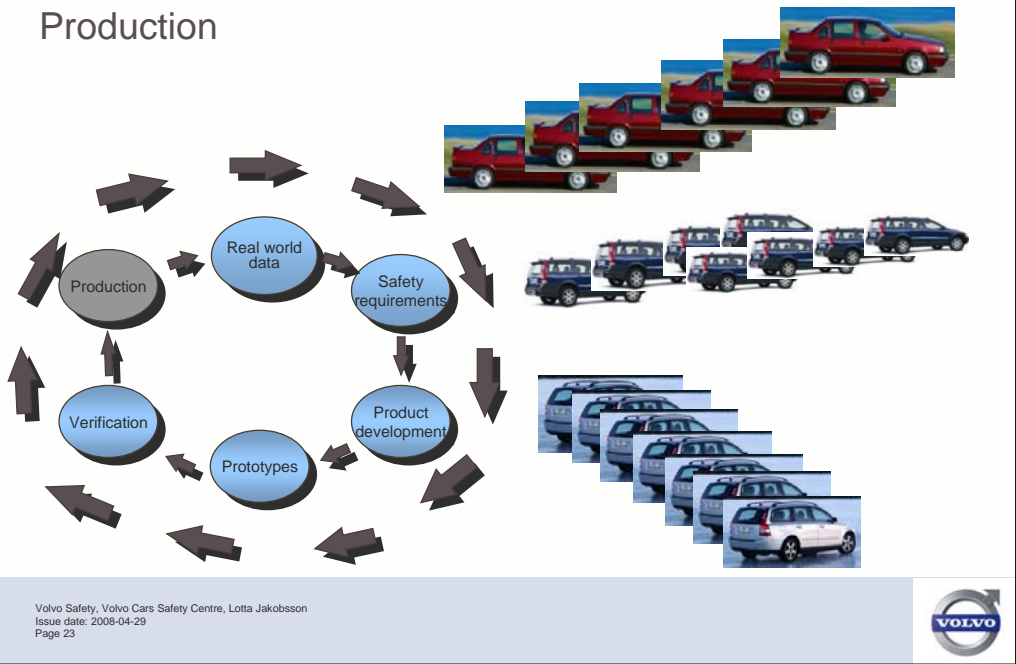
Verification



P_L_P98_0P71_P08_3A101



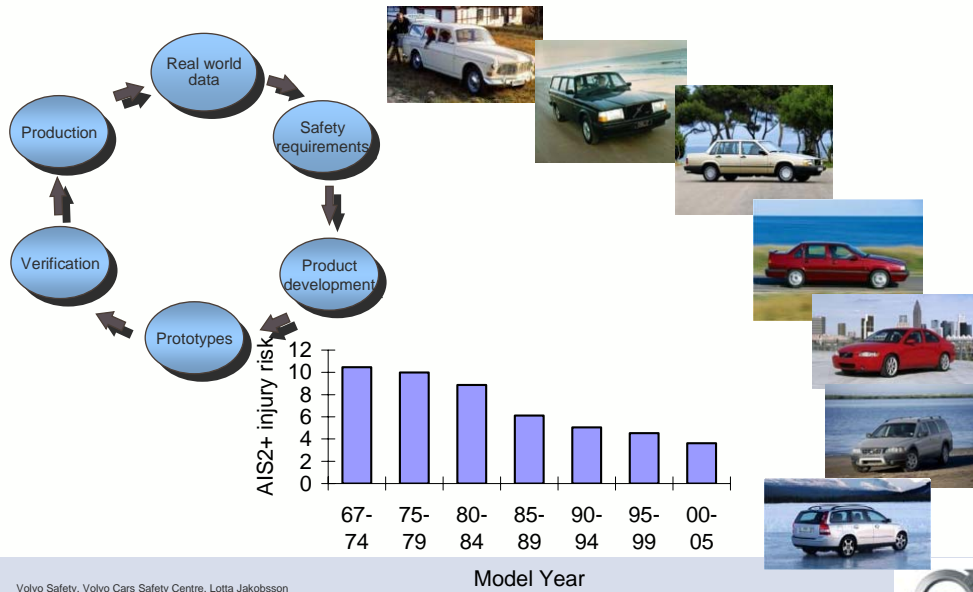
Production



Volvo Safety, Volvo Cars Safety Centre, Lotta Jakobsson
 Issue date: 2008-04-29
 Page 23



AIS2+ injury risk reduction over time



Volvo Safety, Volvo Cars Safety Centre, Lotta Jakobsson
 Issue date: 2008-04-29
 Page 24



Crash test dummies

Frontal Impact

Hybrid III

5th, 50th, 95th

3, 6 year old

CRABI

6, 12, 18 month

THOR

Rear-end Impact

BioRID

RID



Side Impact

SID

BioSID

EuroSID1

SIDIIs

WorldSID

Other

Pedestrian

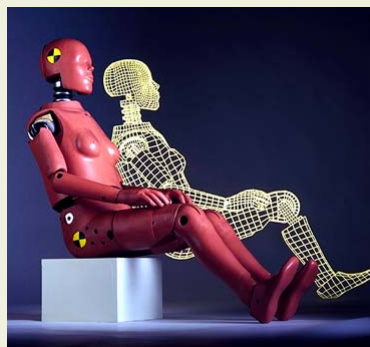
Headform

Volvo Safety, Volvo Cars Safety Centre, Lotta Jakobsson
Issue date: 2008-04-29
Page 25



Hybrid III adult dummies

5%-ile small female	48kg	156cm
50%-ile average male	78kg	183cm
95%-ile large male	101kg	190cm



Volvo Safety, Volvo Cars Safety Centre, Lotta Jakobsson
Issue date: 2008-04-29
Page 26



CRABI - "Child Restraint Air Bag Interaction" dummy

6 Month Old
- developed late 1992

12 Month Old
- developed 1993

18 Month Old
- developed 1994



Volvo Safety, Volvo Cars Safety Centre, Lotta Jakobsson
Issue date: 2008-04-29
Page 27



Q- child dummies

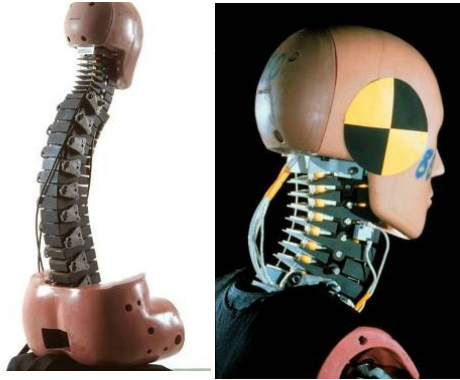


Volvo Safety, Volvo Cars Safety Centre, Lotta Jakobsson
Issue date: 2008-04-29
Page 28

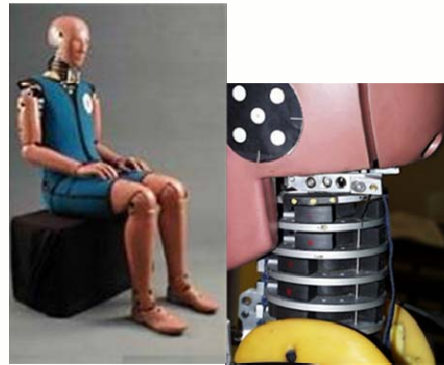


Rear Impact Dummies

BioRID-
Biofidelic Rear Impact Dummy



RID –
Rear Impact Dummy



Volvo Safety, Volvo Cars Safety Centre, Lotta Jakobsson
Issue date: 2008-04-29
Page 29



Volvo Cars Safety Centre



Volvo Safety, Volvo Cars Safety Centre, Lotta Jakobsson
Issue date: 2008-04-29
Page 30

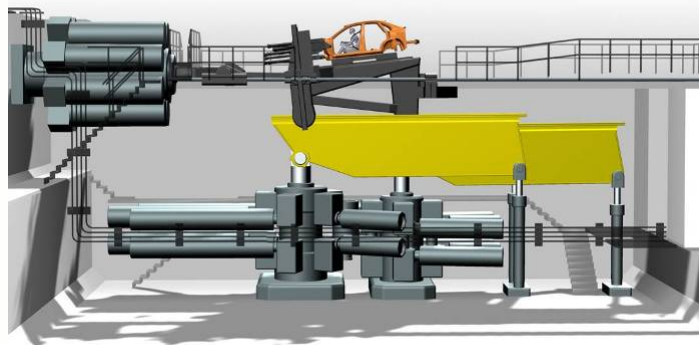




Volvo Safety, Volvo Cars Safety Centre, Lotta Jakobsson
Issue date: 2008-04-29
Page 31



Crash Simulator



Volvo Safety, Volvo Cars Safety Centre, Lotta Jakobsson
Issue date: 2008-04-29
Page 32



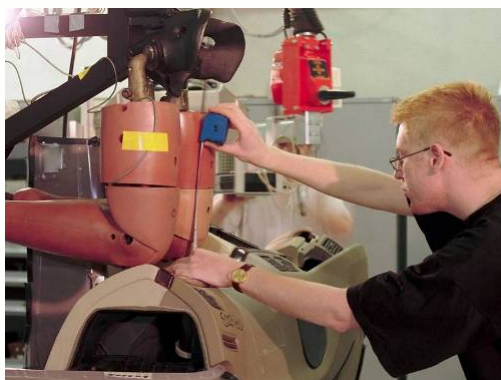
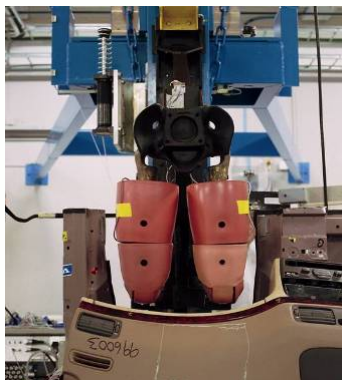
Free Motion Head Rig



Volvo Safety, Volvo Cars Safety Centre, Lotta Jakobsson
Issue date: 2008-04-29
Page 33



Drop Test Rig



Volvo Safety, Volvo Cars Safety Centre, Lotta Jakobsson
Issue date: 2008-04-29
Page 34

