It’s about Trucks ...
From Reality … to Reality
Global warming

September 16, 2012
More than 150 cubic meter per second

Non conventional oil:
- Processing gains
- Light tight oil
- Other unconventional oil
- NGLs

Crude oil:
- Currently producing
- Fields yet-to-be found
- Fields yet-to-be developed
EMS modules

<table>
<thead>
<tr>
<th>Central axle trailer</th>
<th>Semitrailer</th>
<th>Link</th>
<th>Dolly</th>
<th>Tractor</th>
<th>Rigid</th>
</tr>
</thead>
</table>

**Standard vehicle (EU)**
16,5 m 40/44 ton

**EMS-vehicle (Sweden, Finland, The Netherlands and Denmark)**
25,25 m 60 ton

**Duo2-vehicle**
32 m 80 ton
Larger Vehicles ... Less Fuel & Emissions

- **Standard vehicle (EU)**: 16.5 meter, 40/44 ton
- **EMS-vehicle (Sweden, Finland, The Netherlands and Denmark)**: 25.25 meter, 60 ton
- **Duo2-vehicle**: 32 meter, 80 ton

85% and 73% reduction in fuel and emissions compared to the standard vehicle.
Tests on dedicated roads

Max 80 ton distributed on 11 axles
EMS – European Modular System

Directive 96/53

Potential combinations

#1 New Vehicle Combinations
Product Variance

Transport Mission
- Vehicle Type
- Body & Equipment
- GCW

Vehicle Utilization
- Operating Cycle
- Speed changes
- Manoeuvring
- Yearly usage

Operating Environment
- Road Condition
- Topography
- Curve Density
- Altitude
- Ambient Temp.
Product Variance
Strategic Vehicle Specifications

10^200
200,000
100 – 1000
10+
1

“The Product Structure”
“The Production”
“The SVS:s” ~
“The Platform”
“The Project”
“The Vehicle”
Analysis Quality & Throughput

“Error” or “1 / Quality”

“Analysis Time” or “1 / Throughput”

Concept Evaluation Tools

Model & Data Transparency

Final Verification Tools
Multi-Criteria Optimization

- Durability
- Cost
- Transport Efficiency
- Handling
- Weight
- Agility
- Ride Comfort

#3 Lean Simulations
In Control

... of Control

Driver

Vehicle

Environment
Interactions

<table>
<thead>
<tr>
<th>Reality</th>
<th>Controller</th>
<th>Brain</th>
</tr>
</thead>
<tbody>
<tr>
<td>Driver</td>
<td><img src="image" alt="Driver" /></td>
<td><img src="image" alt="Brain" /></td>
</tr>
<tr>
<td>Environment</td>
<td><img src="image" alt="Environment" /></td>
<td><img src="image" alt="Brain" /></td>
</tr>
<tr>
<td>Vehicle</td>
<td><img src="image" alt="Vehicle" /></td>
<td><img src="image" alt="Brain" /></td>
</tr>
</tbody>
</table>
Driver Variance
What’s real?

<table>
<thead>
<tr>
<th>Scenario</th>
<th>Off-line Simulation</th>
<th>Driving Simulator</th>
<th>Proving Ground</th>
<th>Field Test</th>
<th>Real Life</th>
</tr>
</thead>
<tbody>
<tr>
<td>Driver</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Environment</td>
<td></td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Vehicle</td>
<td></td>
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</table>

Driving Simulator Studies

- Driver
- Environment
- Vehicle
- Scenario

- Off-line Simulation
- Driving Simulator
- Proving Ground
- Field Test
- Real Life
### Accident Research

#### Traffic Accidents Involving Heavy Trucks Causing Serious to Fatal Injuries - WESTERN EUROPE

<table>
<thead>
<tr>
<th>Road user Group</th>
<th>Type Accident</th>
<th>Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>B. Car Occupants</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>55-65%</td>
<td><strong>B1</strong> Truck-car collision, oncoming traffic: Truck front vs. car front,</td>
<td>35%</td>
</tr>
<tr>
<td>60%</td>
<td><strong>B2</strong> Truck-car collision, oncoming traffic, Truck side vs. car front/side (Sidewipe)</td>
<td>10%</td>
</tr>
<tr>
<td></td>
<td><strong>B3</strong> Truck-car collision, oncoming traffic, Truck front vs. car side</td>
<td>5%</td>
</tr>
<tr>
<td></td>
<td><strong>B4</strong> Truck-car collision, traffic ahead in same direction, Truck front vs. car rear</td>
<td>10%</td>
</tr>
<tr>
<td></td>
<td><strong>B5</strong> Truck-car collision, intersection, Truck front vs. car side</td>
<td>15%</td>
</tr>
<tr>
<td></td>
<td><strong>B6</strong></td>
<td>10%</td>
</tr>
</tbody>
</table>

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**Figure 4.** Truck seen from above. The numbered fields, 1-8, show areas that can be difficult for the driver to see.

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Volvo Group Trucks Technology
Vehicle Dynamics Challenges

# 1 New Vehicle Combinations
# 2 Product Configurations
# 3 Lean Simulations
# 4 Driver Models
# 5 Scenarios

One more thing ...
Tyre Models!

Variation in Cornering Stiffness due to test methods 20 - 40%
Limited knowledge about Customer Behaviour & Perceptions in their Operating Environments can not be compensated by state-of-the-art Analysis Methods

All areas have to be in balance and continuously improved
SHAPING
ANOTHER FUTURE

www.volvogroup.com