Introduction to Human-Vehicle integration
Why automated vehicles

Cars
- Safety
- Fuel
- Comfort
- Convenience
- Pleasure
- Better traffic flow, less congestion

American magazine *Boys’ Life*, June 1956.
Why automated vehicles

Trucks

- Safety
- Fuel
- Higher productivity
- More uptime
- Better traffic flow, less congestion
- Competition
- Replace the driver (?)
Why Human-Vehicle integration is important in automated vehicles

- The automation system has been put in because it can do the job better than the driver.
- Automated systems are not perfect or complete.
- The human driver is being asked to monitor that the automation system is working effectively and to take control if necessary.
Why Human-Vehicle integration is important

The SAE levels 1-5 can be regarded as steps towards more advanced and "better" automation functions. From a Human Factors perspective this may not always be applicable. Level 3: The system is in control of the dynamic driving tasks and also monitoring the driving environment.

*Driver is taken Out-of-the-loop*

"The human driver will respond appropriately to a request to intervene". The driver is the fallback of the dynamic driving tasks in situations the system cannot handle.

*Driver needs to be brought back In-the-loop*

Not monitoring the driving environment and still act appropriately and safely, on request could be difficult.
//Human-Vehicle-System integration

- Multi-agent system:
  - The human driver
  - The automation system

- The two agents interact with the intentions to achieve common goals.

As long as human drivers are part of the automated system Human Factors is fundamental for the vehicle’s performance.
//Use Cases

A use case is a description of a sequence of interactions between the user and the technical system.

- Function as means for communication between team members and to achieve agreements.
- Provide a basis for defining requirements (Human Factors as well as technical).
Experiments

Research areas

• **Driver-in/out of-the-loop**: Situation-Mode- and Task awareness

• **Driver state**: inattention, distraction etc.

• **Non-driving related 2\textsuperscript{nd} tasks**: the influence on drivers’ reactions in critical situations

• **Transitions**: from automation to manual control and vice versa.

• **Arbitration**: Interaction & decision strategies between the driver and automation system.
//Human Factors Recommendations

High level design guidelines addressing Human Factors challenges regarding the interaction between the human driver and the automated systems.
Human vehicle integration presentations, June 29

- **Introduction**
  Mikael Söderman, Volvo Group

- **Use Cases**
  Stefan Wolter, Ford Europe

- **Experiments**
  Natasha Merat, Leeds University

- **Q & A**

- Coffee break

- **10.45-11.15, Human Factors recommendations**
  Johann Kelsch, DLR

Breakout session in the Exhibition hall
Thank you.

Dr. Mikael Söderman, Volvo Group
mikael.soderman@volvo.com