Autoliv
The Worldwide Leader in Automotive Safety

EXANE BNP PARIBAS,Stutgart
Henrik Kaar
Oliver Briemle
October 1, 2014

Autoliv

Safe Harbor Statement *

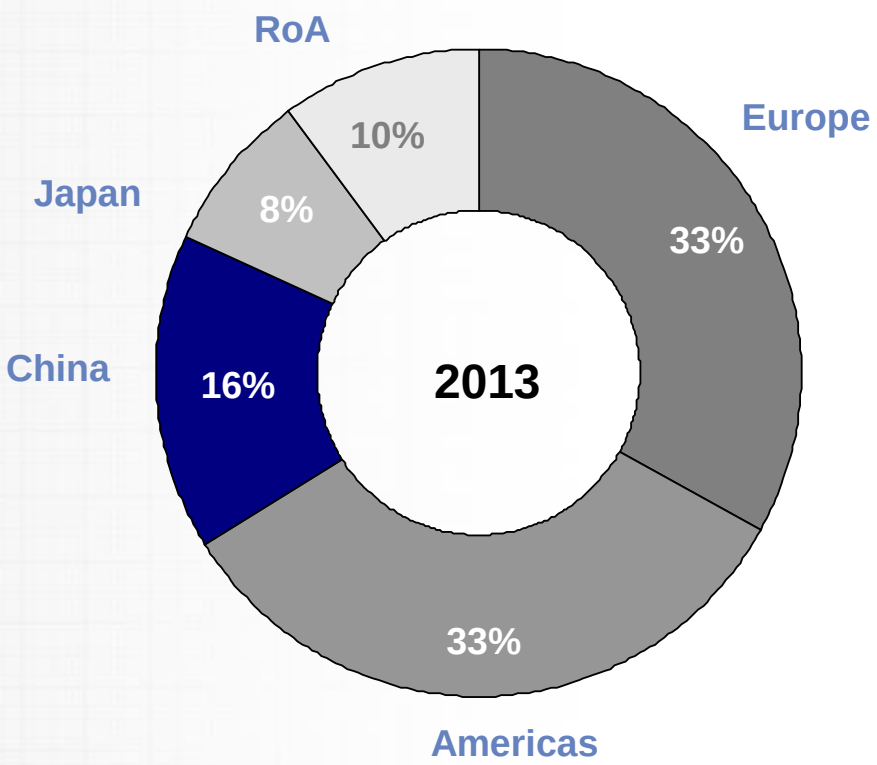
This presentation contains statements that are not historical facts but rather forward-looking statements within the meaning of the Private Securities Litigation Reform Act of 1995. Such forward-looking statements include those that address activities, events or developments that Autoliv, Inc. or its management believes or anticipates may occur in the future. All forward-looking statements, including without limitation, management's examination of historical operating trends and data, as well as estimates of future sales, operating margin, cash flow, effective tax rate or other future operating performance or financial results, are based upon our current expectations, various assumptions and data available from third parties. Our expectations and assumptions are expressed in good faith and we believe there is a reasonable basis for them. However, there can be no assurance that such forward-looking statements will materialize or prove to be correct as forward-looking statements are inherently subject to known and unknown risks, uncertainties and other factors which may cause actual future results, performance or achievements to differ materially from the future results, performance or achievements expressed in or implied by such forward-looking statements. Because these forward-looking statements involve risks and uncertainties, the outcome could differ materially from those set out in the forward-looking statements for a variety of reasons, including without limitation, changes in global light vehicle production; fluctuation in vehicle production schedules for which the Company is a supplier, changes in general industry and market conditions, changes in and the successful execution of our capacity alignment, restructuring and cost reduction initiatives discussed herein and the market reaction thereto; loss of business from increased competition; higher raw material, fuel and energy costs; changes in consumer and customer preferences for end products; customer losses; changes in regulatory conditions; customer bankruptcies or divestiture of customer brands; unfavorable fluctuations in currencies or interest rates among the various jurisdictions in which we operate; component shortages; market acceptance of our new products; costs or difficulties related to the integration of any new or acquired businesses and technologies; continued uncertainty in pricing negotiations with customers, our ability to be awarded new business; product liability, warranty and recall claims and other litigation and customer reactions thereto; higher expenses for our pension and other postretirement benefits; work stoppages or other labor issues; possible adverse results of pending or future litigation or infringement claims; negative impacts of antitrust investigations or other governmental investigations and associated litigation (including securities litigation) relating to the conduct of our business; tax assessments by governmental authorities and changes in our effective tax rate; dependence on key personnel; legislative or regulatory changes limiting our business; political conditions; dependence on and relationships with customers and suppliers; and other risks and uncertainties identified under the headings "Risk Factors" and "Management's Discussion and Analysis of Financial Condition and Results of Operations" in our Annual Reports and Quarterly Reports on Forms 10-K and 10-Q and any amendments thereto. The Company undertakes no obligation to update publicly or revise any forward-looking statements in light of new information or future events. For any forward-looking statements contained in this or any other document, we claim the protection of the safe harbor for forward-looking statements contained in the Private Securities Litigation Reform Act of 1995, and we assume no obligation to update any such statement.

(*) Non-US GAAP reconciliations are disclosed in our 8-K/10-K/10-Q filings available at www.sec.gov or www.autoliv.com.

Autoliv

Autoliv in Brief

- Sales LTM* US$ 9.1 billion
- Sales to all major vehicle manufacturers
- Fortune 500 company with an A- credit rating (S&P)
- ~ 80 facilities in 29 countries
- 18 technical centers and 20 crash test tracks
- ~ 59,000 associates of which > 5,000 in R,D&E

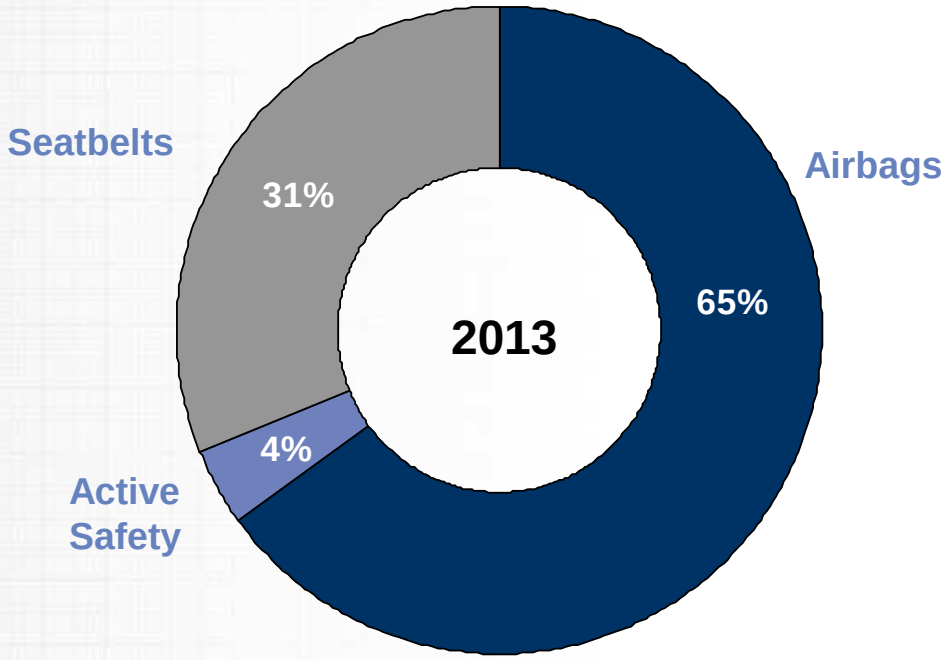


Well balanced geographic presence

* Q3-2013 trough Q2-2014

Autoliv in Brief

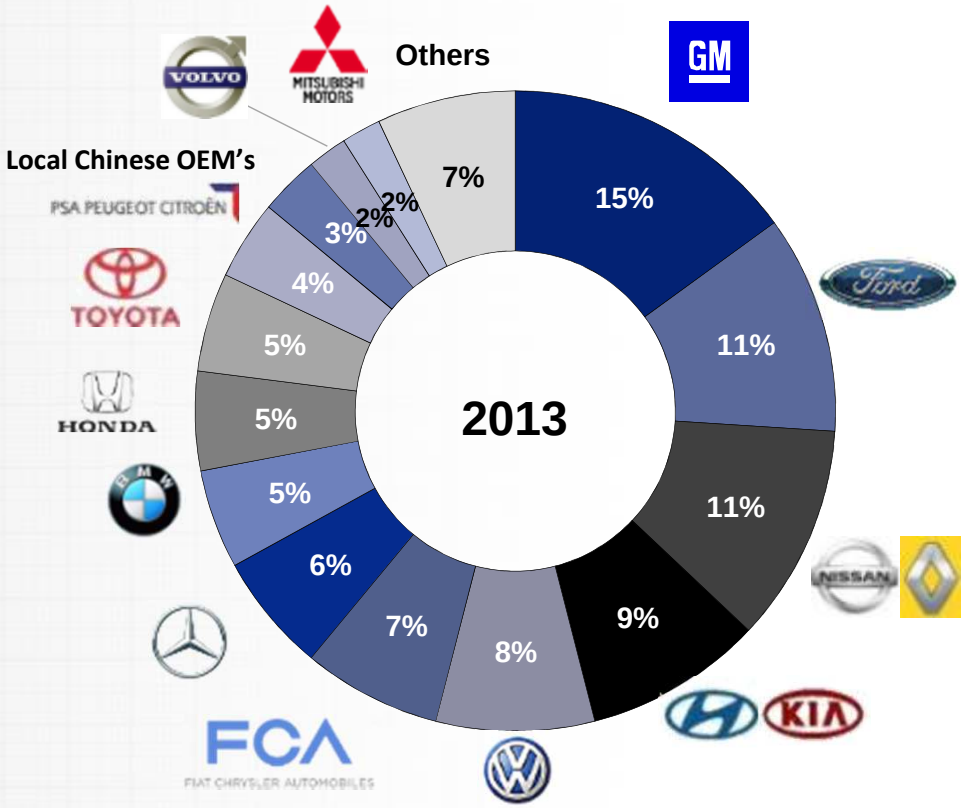
- Sales LTM* US$ 9.1 billion
- Sales to all major vehicle manufacturers
- Fortune 500 company with an A- credit rating (S&P)
- ~ 80 facilities in 29 countries
- 18 technical centers and 20 crash test tracks
- ~ 59,000 associates of which > 5,000 in R,D&E



* Q3-2013 trough Q2-2014

Autoliv in Brief

- Sales LTM* US$ 9.1 billion
- Sales to all major vehicle manufacturers
- Fortune 500 company with an A- credit rating (S&P)
- ~ 80 facilities in 29 countries
- 18 technical centers and 20 crash test tracks
- ~ 59,000 associates of which > 5,000 in R,D&E



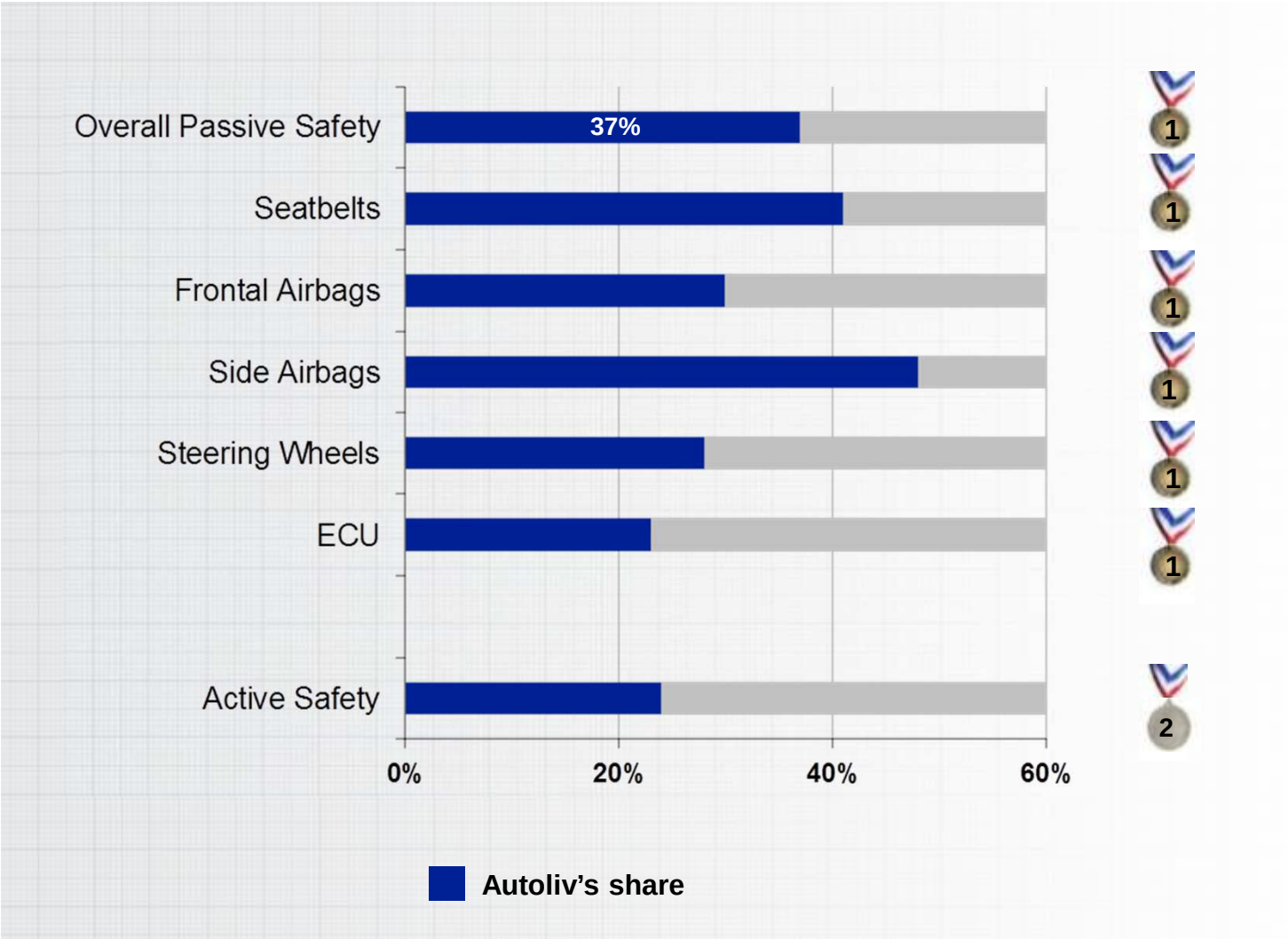
Our diversified customer base includes virtually all the world's vehicle manufacturers

* Q3-2013 trough Q2-2014

Autoliv

Market Shares 2013

- Global Safety Market Share by Product



Autoliv

Key Focus Areas

Saving lives and safety around the automobile

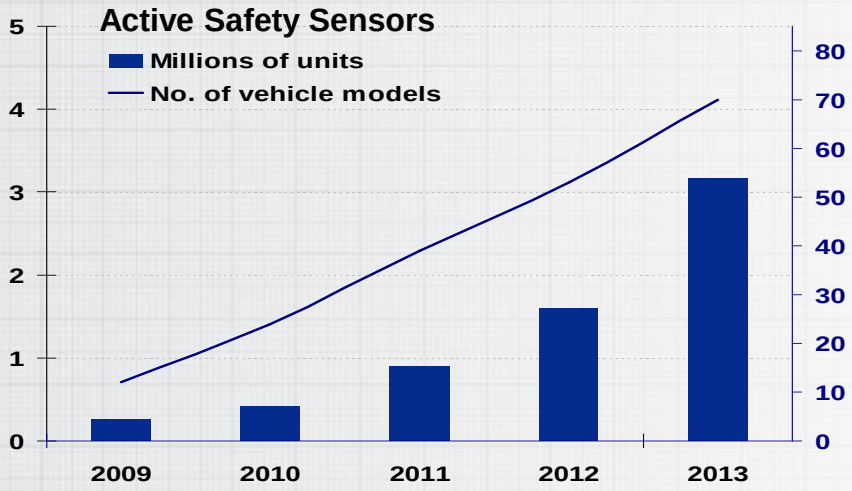
Lead thru innovation and technology

Leverage global footprint and talented-skilled people

Zero defects and customer focus

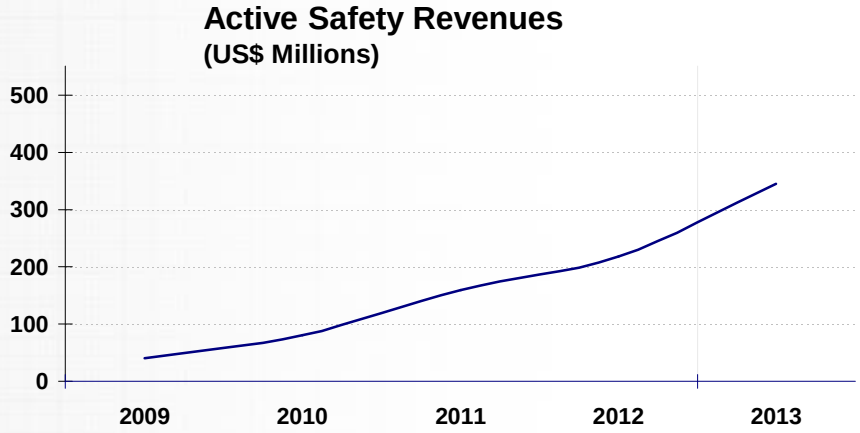
Autoliv

Executing our Growth Strategies
- Active Safety organic growth ~ 52% during H1'14



RD&E Investments:

- Many new technologies in development
- Increasing customer expectations
- Improve leverage as we gain critical mass



Technology investment for active safety is contributing to top-line growth

Autoliv

Launches Paris Motor Show 2014

2014 PARIS MONDIAL DE L'AUTOMOBILE

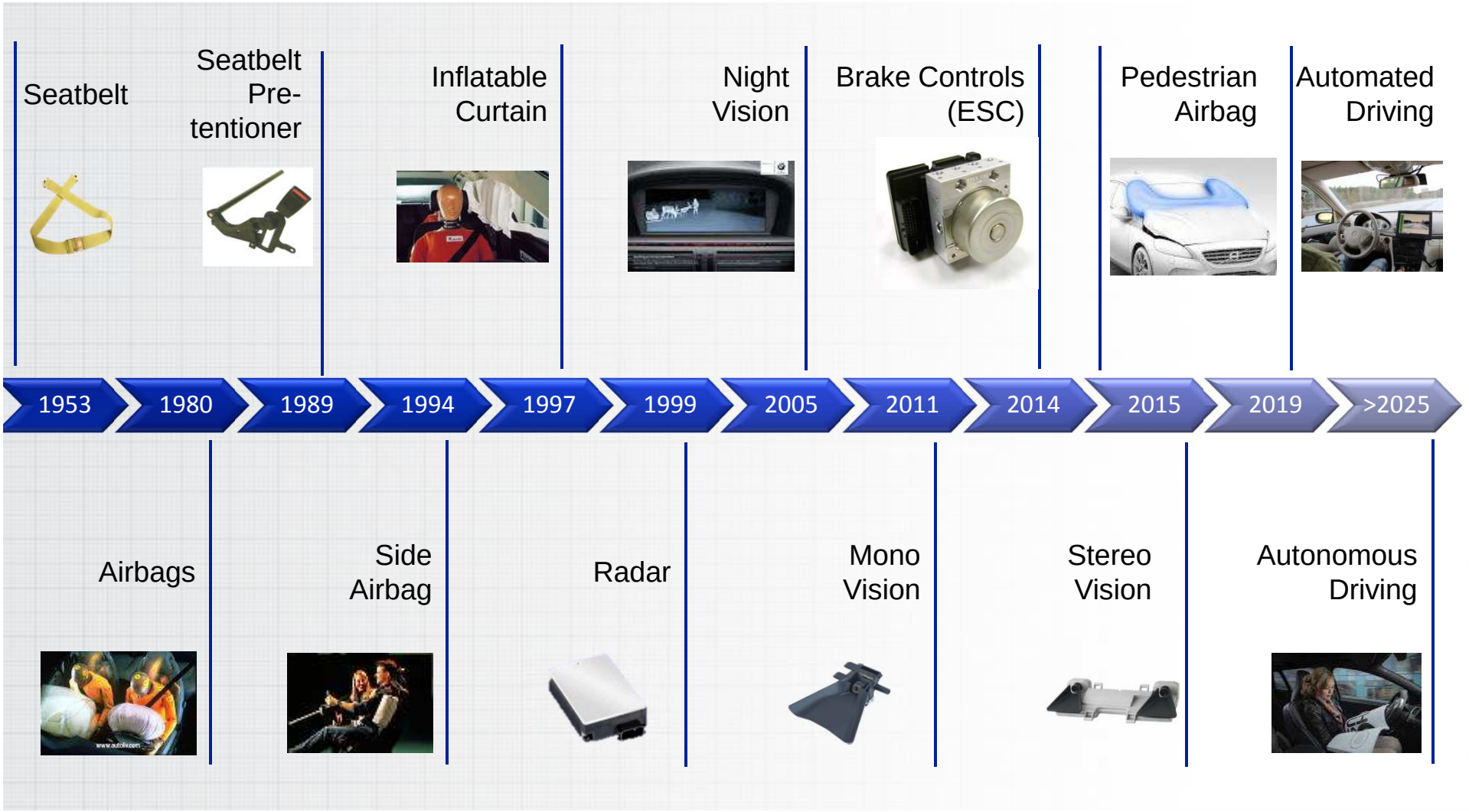
These models represents annual sales of approx. 370 MUSD

Autoliv

Inauguration of Active Safety Test Center

- Unique track for testing advanced safety systems in all kinds of traffic and traffic situations.

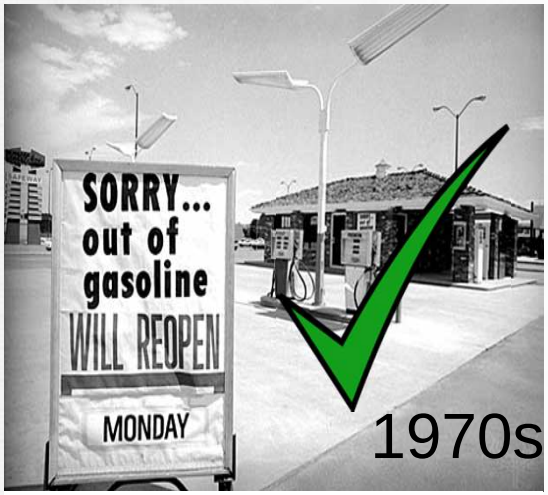
Autoliv Safety from 1950



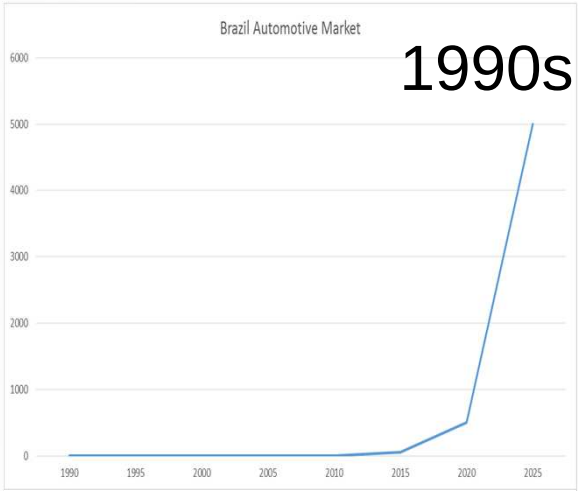

The needs now and later …
Autoliv

Great Automotive Trends – Fact or Hype?

We will soon have flying cars



Cars will soon get 50 MPG/ 4.7 l/100km



The Brazil market is going to take off

We will soon have self-driving cars …

Autoliv

Active Safety Features

AEB: Autonomous Emergency Braking

Function:
alerts the driver, tightens the active seatbelt, puts the brakes in an alert mode, and applies the brakes autonomously.

(radar or vision)

TSR: Traffic Sign Recognition

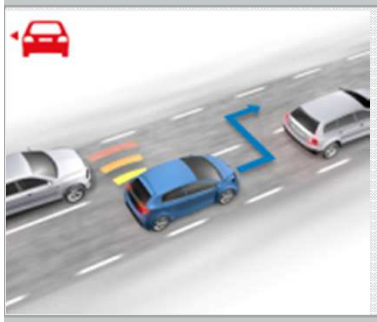
Function:
a symbol is displayed in the instrument cluster or on the Head-up Display showing the current speed limit or other important road signs.

(vision)

HBA: High Beam Assist

Function:
automatically switches between high and low beams.

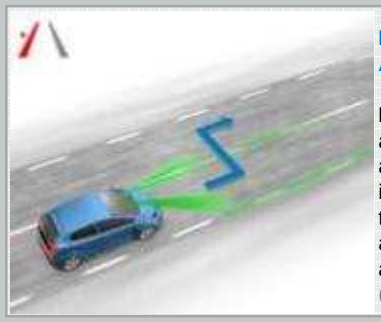
(vision)



BSM: Blind Spot Monitor

Function:
alerts the driver by lighting a warning indicator on the appropriate side.

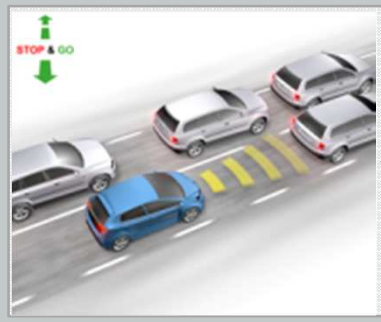
(radar)



LKA: Lane Keeping Assist

Function:
alerts the driver with acoustical or haptic warnings and/or a symbol on the head-up display, and applies steering autonomously.

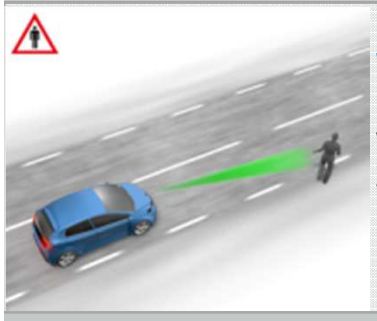
(vision)



QA: Queue Assist

Function:
maintains a set speed/distance to a vehicle ahead down to a standstill.

(radar or vision)



Pedestrian Detection / Warning

Function:
warns the driver or even autonomously brakes the vehicle.

(vision)

ACC: Adaptive Cruise Control

Function:
maintains a set speed/distance to a vehicle ahead.

(radar)

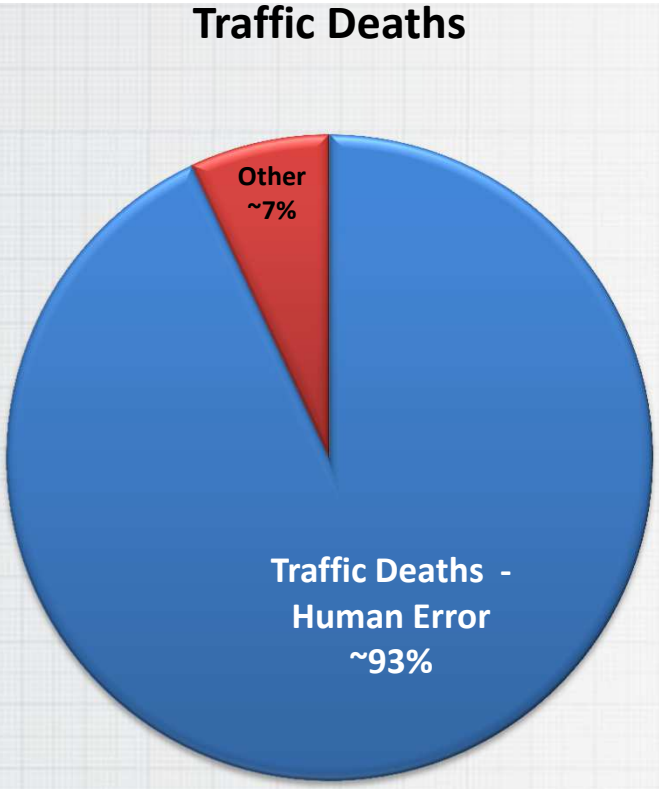
CTA: Cross-Traffic Assist

Function:
acoustic alert for rear crossing obstacles.

(radar)

Autoliv

Automated Driving



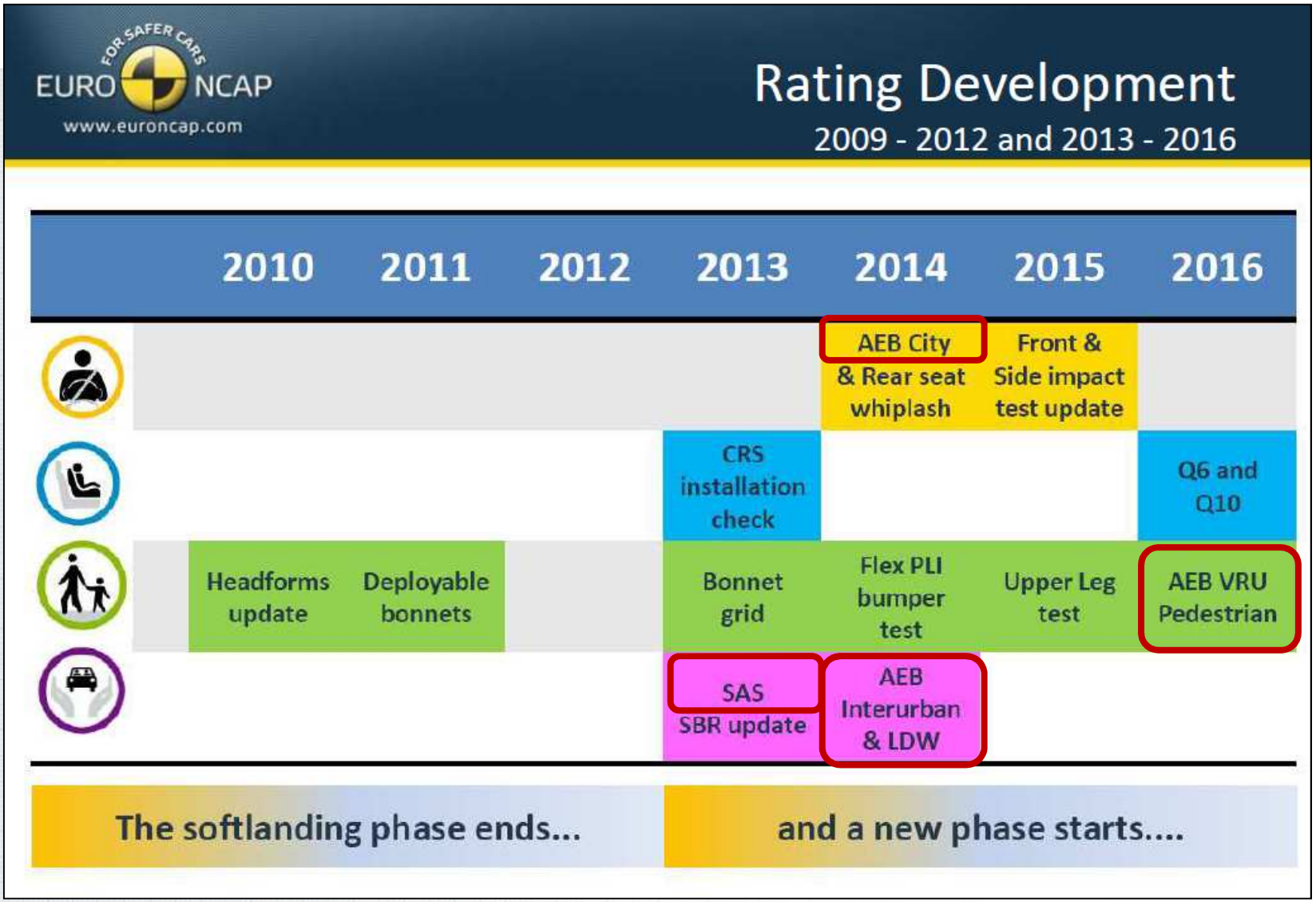
By eliminating human errors that cause traffic accidents, Automated Driving can:

- Prevent millions of crashes
- Reduce the severity of injuries and property damage
- Save lives

Additional benefits:

- Increase driver comfort and productivity
- Use infrastructure more efficiently
- Reduce environmental impact
- Improve mobility

Euro NCAP Time Line



Active Safety Items 2013-16

Source: Presentation given by Euro NCAP president Andre Seek during AsPeCSs Final Event, June 30th 2014

Autoliv

Euro NCAP Time Line

Active Safety Items 2013-16

Active Safety Items 2016-20

Source: Presentation given by Euro NCAP president Andre Seek during AsPeCSs Final Event, June 30th 2014

Autoliv

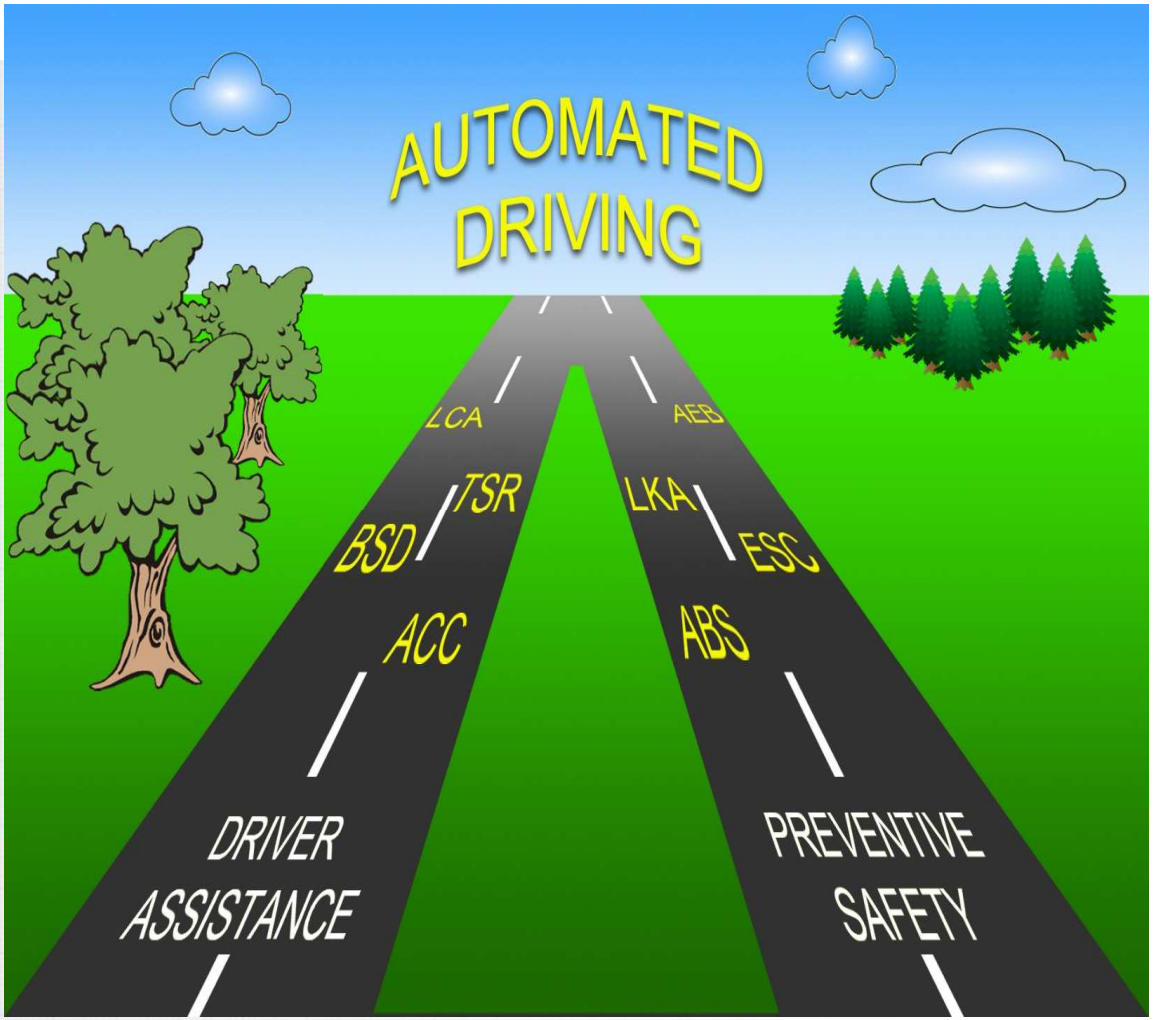
“Assistance – Prevention – Protection”

- Safety in all aspects

Assistance Features	Prevention Features	Protection Features
▪ Adaptive Cruise Control ▪ Blind Spot Monitor ▪ High Beam Assist ▪ Traffic Sign Recognition ▪ Rear Cross Traffic Alert	▪ Forward Collision Warning & Auto. Emergency Braking ▪ Lane Departure Warning & Lane Keeping Assist ▪ Pedestrian Warning ▪ ABS & Stability Control	▪ Airbags ▪ Seatbelts ▪ Pre-pretensioners ▪ Pedestrian Protection

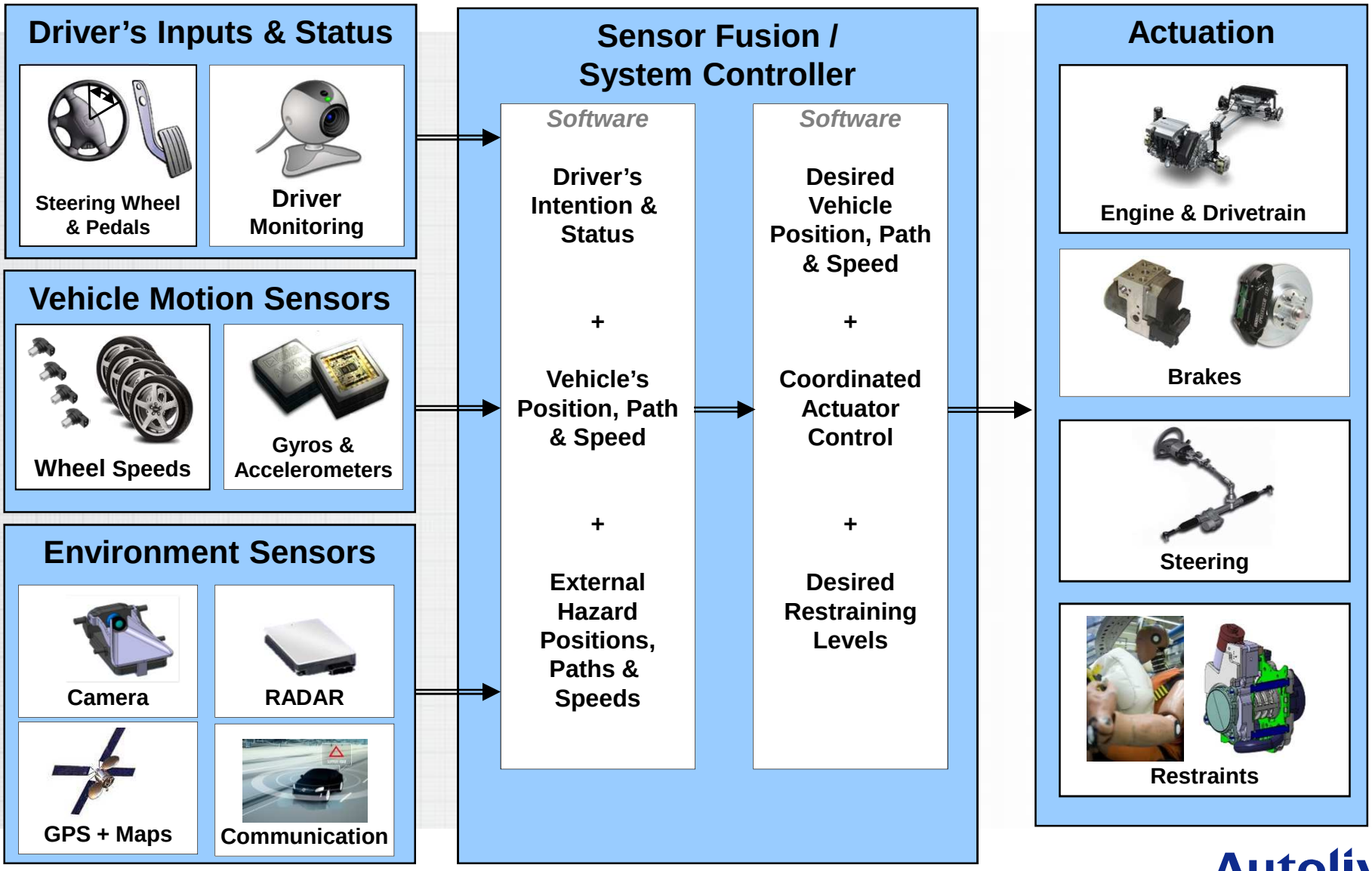
Autoliv

Merging Roads



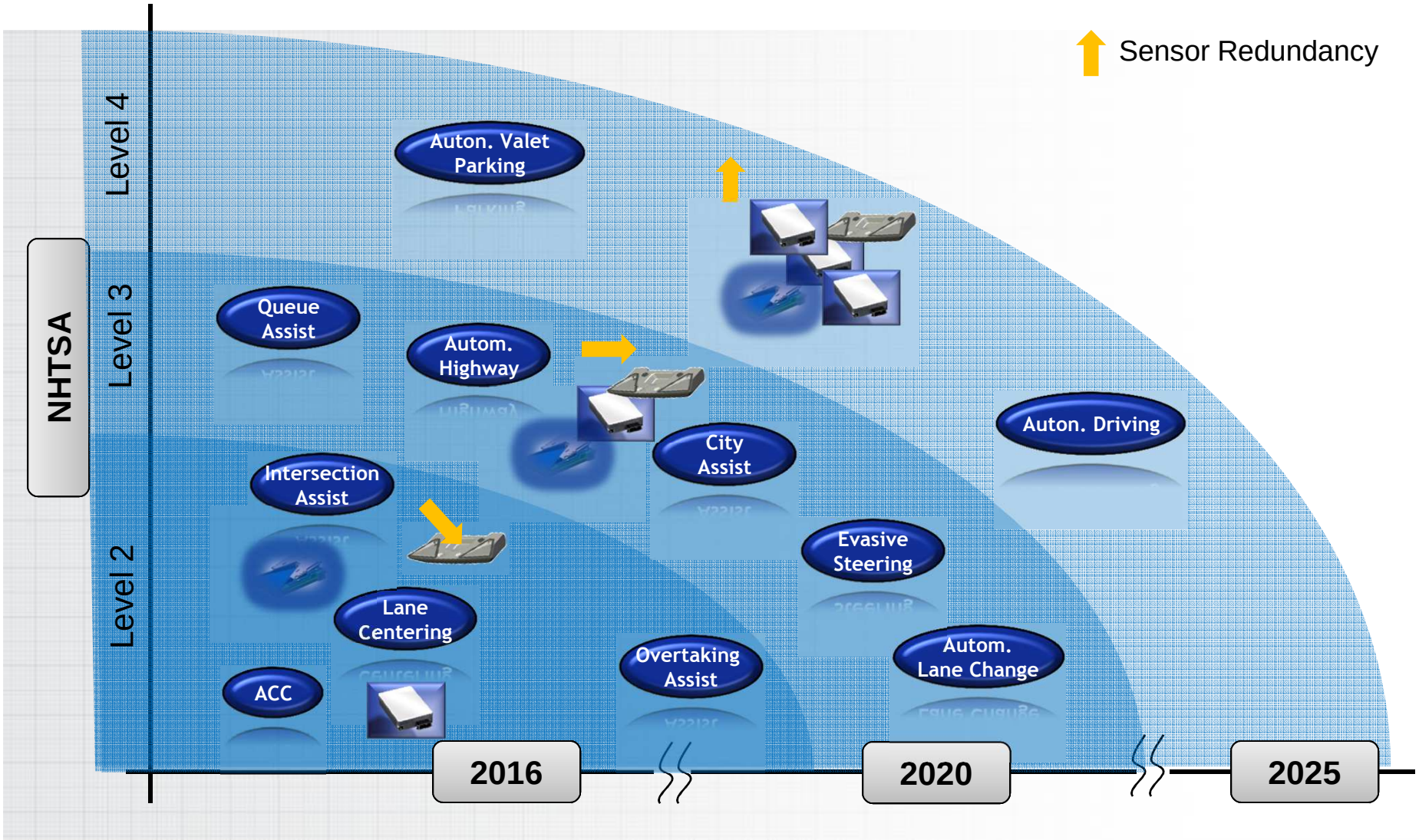
Autoliv

System Components, Functional Diagram



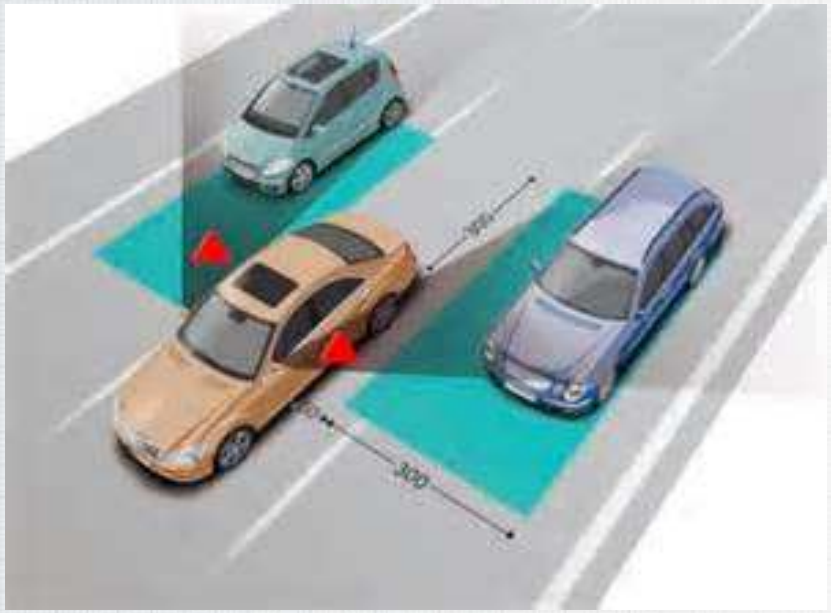
Autoliv

Function Roadmap vs NHTSA



Autoliv

NHTSA Level 0 (No Automation)



- Driver in complete control (brake, steering, throttle)
  - Blind Spot Detection
  - Forward Collision Warning
  - Lane Departure Warning

Systems provide only warning

Autoliv

NHTSA Level 1 (Function Specific Automation)

- Automates one or more specific functions
  - Anti-Lock Brake System (ABS)
  - Electronic Stability Control (ESC)
  - Autonomous Emergency Braking (AEB)
  - Adaptive Cruise Control (ACC)

NHTSA Level 2 (Combined Function)

- Automation of at least two primary functions
  - Adaptive Cruise Control
  - Lane Centering

Autoliv

NHTSA Level 3 (Limited Self Driving)

- Fully automated control of all primary driving functions
  - May require transition back to driver

Autoliv

NHTSA Level 4 (Self Driving)

- **Full control** of all primary/safety critical functions
  - Monitor roadway conditions
  - Includes both unoccupied and occupied vehicles

Autoliv


Technology Enablers and Challenges
Autoliv

Key Active Safety Sensors

Are important to Understanding Surroundings, State of Driver and Vehicle

- **Camera based** – Visual features like lane, traffic signs, light, vehicles and pedestrians

- **Radar based** – Accurate & robust measurement of distance and velocity to various objects

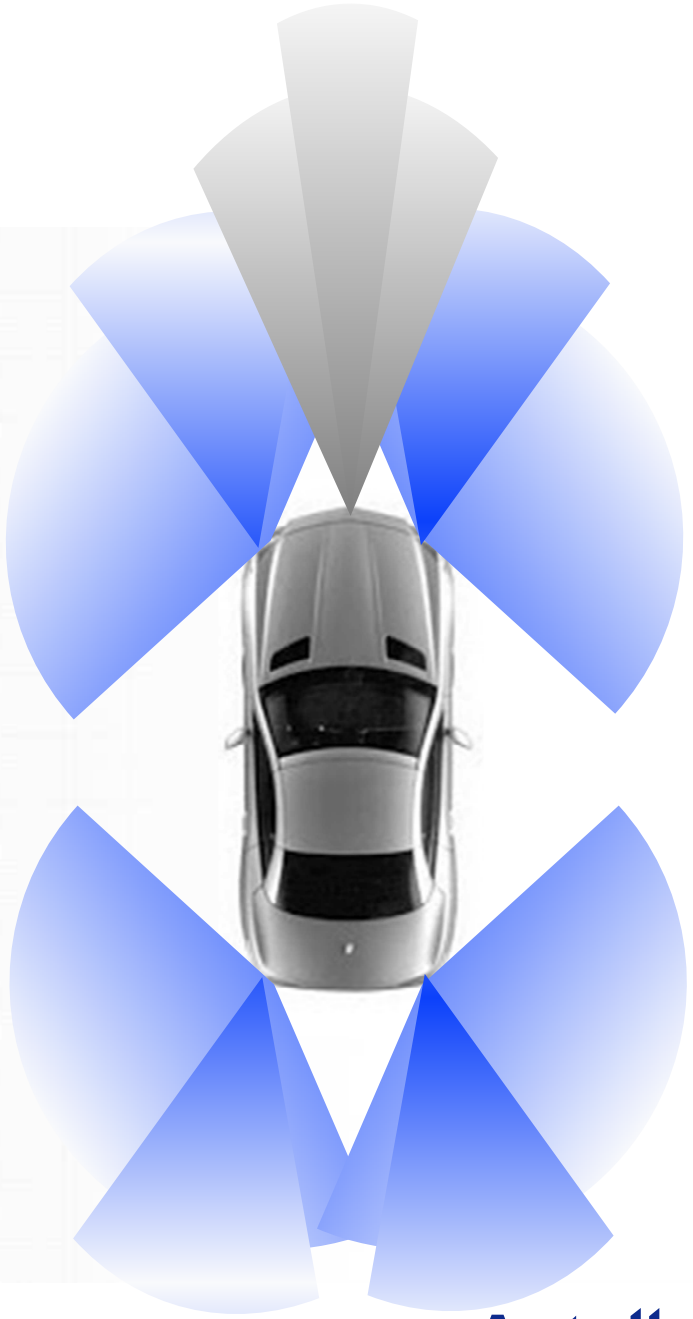
- **Far Infrared based** – sensing living objects like animals and pedestrians using the object thermal signature

Autoliv

Active Safety Sensors
- Radar Technology

- Enabling Radar Sensor Technologies
  - 25GHz Ultra Wide Band Radars
  - 24GHz Narrow Band Radars
  - 77GHz Multi Mode Radars

- High Performance Features Enabled
  - Blind Spot Detection
  - Rear Cross Traffic Alert
  - Lateral Collision Avoidance
  - Forward Collision Warning
  - Rear End Collision Mitigation
  - Autonomous Emergency Braking
  - Adaptive Cruise Control



Autoliv

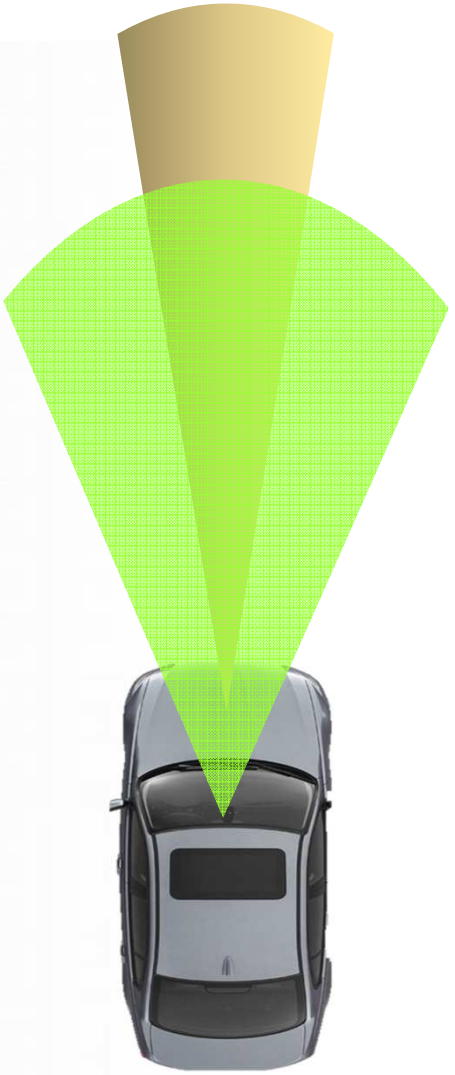
Radar with Forward Collision Warning & Braking
Europe

Autoliv

Active Safety Sensors
- Vision Technology

- Enabling Vision Sensor Technologies
  - Mono Camera
  - Stereo Camera
  - Far Infrared Camera

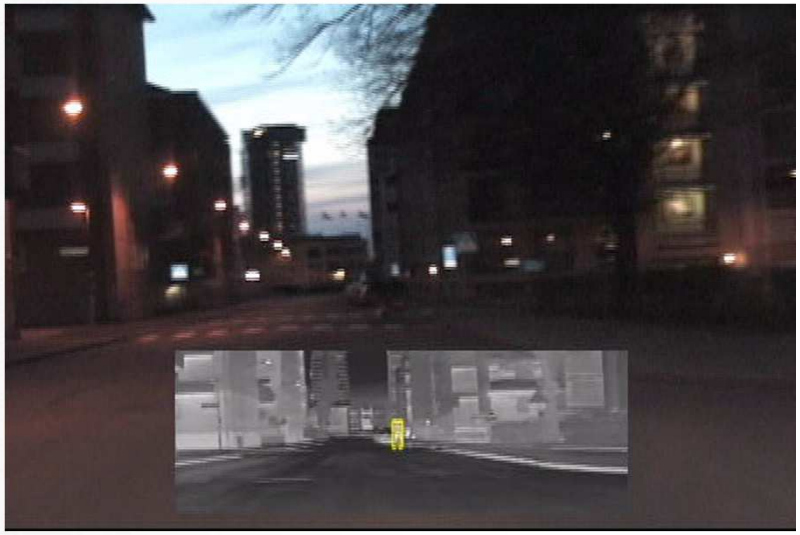
- High Performance Features Enabled
  - Lane Departure Warning / Lane Keep Assist
  - Lane Centering
  - Traffic Sign Recognition
  - Headlight Automation
  - Forward Collision Warning
  - Pedestrian Detection & Collision Warning
  - Animal Detection & Collision Warning
  - Dynamic Spot Light
  - Road Surface Information / Free Space Information
  - Autonomous Emergency Braking
  - Adaptive Cruise Control



Video samples

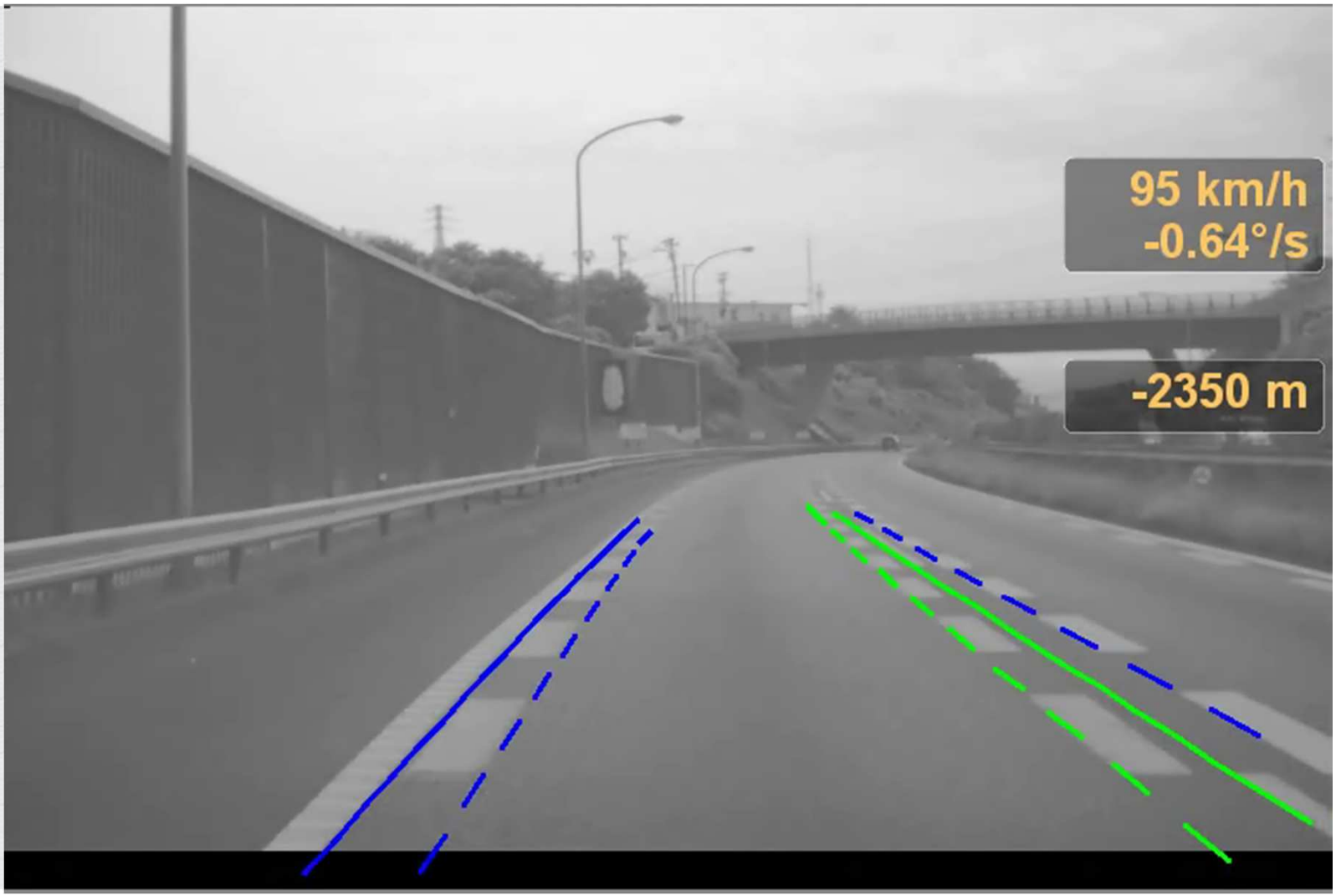
Videos:

- Radar in fog
- Lane Detection
- Traffic Sign Recognition
- Vehicle Detection
- Pedestrian Detection
- General Object Detection
- Free Space Detection
- Night Vision



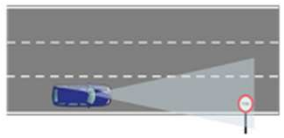
Autoliv

Vision based Lane Detection
Japan – Attention markers



Autoliv

Vision based Traffic Sign Recognition
U.S. Signs



Autoliv

Vision based Vehicle Detection

Sweden

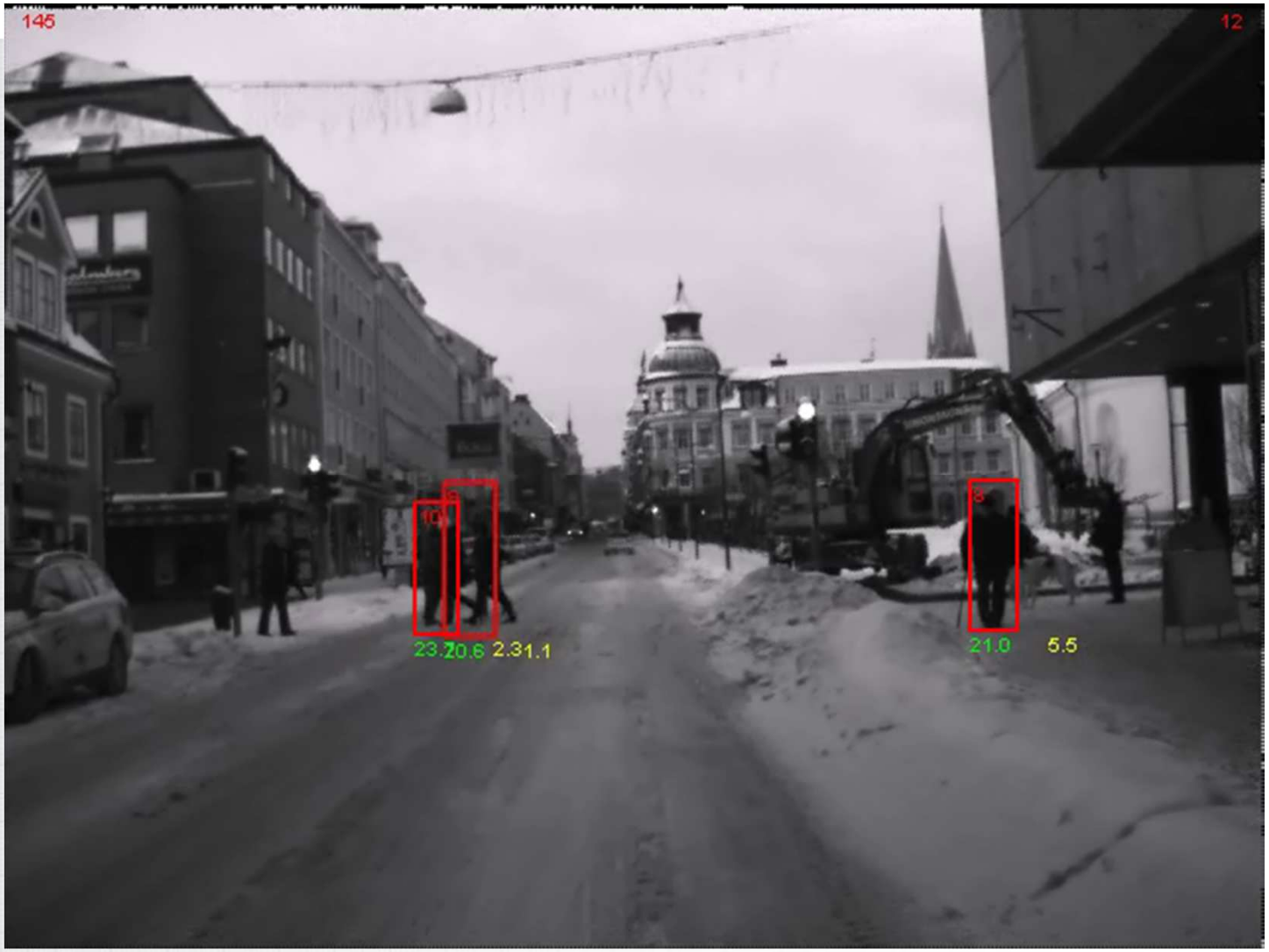
Autoliv

Vision based Vehicle Detection Night driving

Autoliv

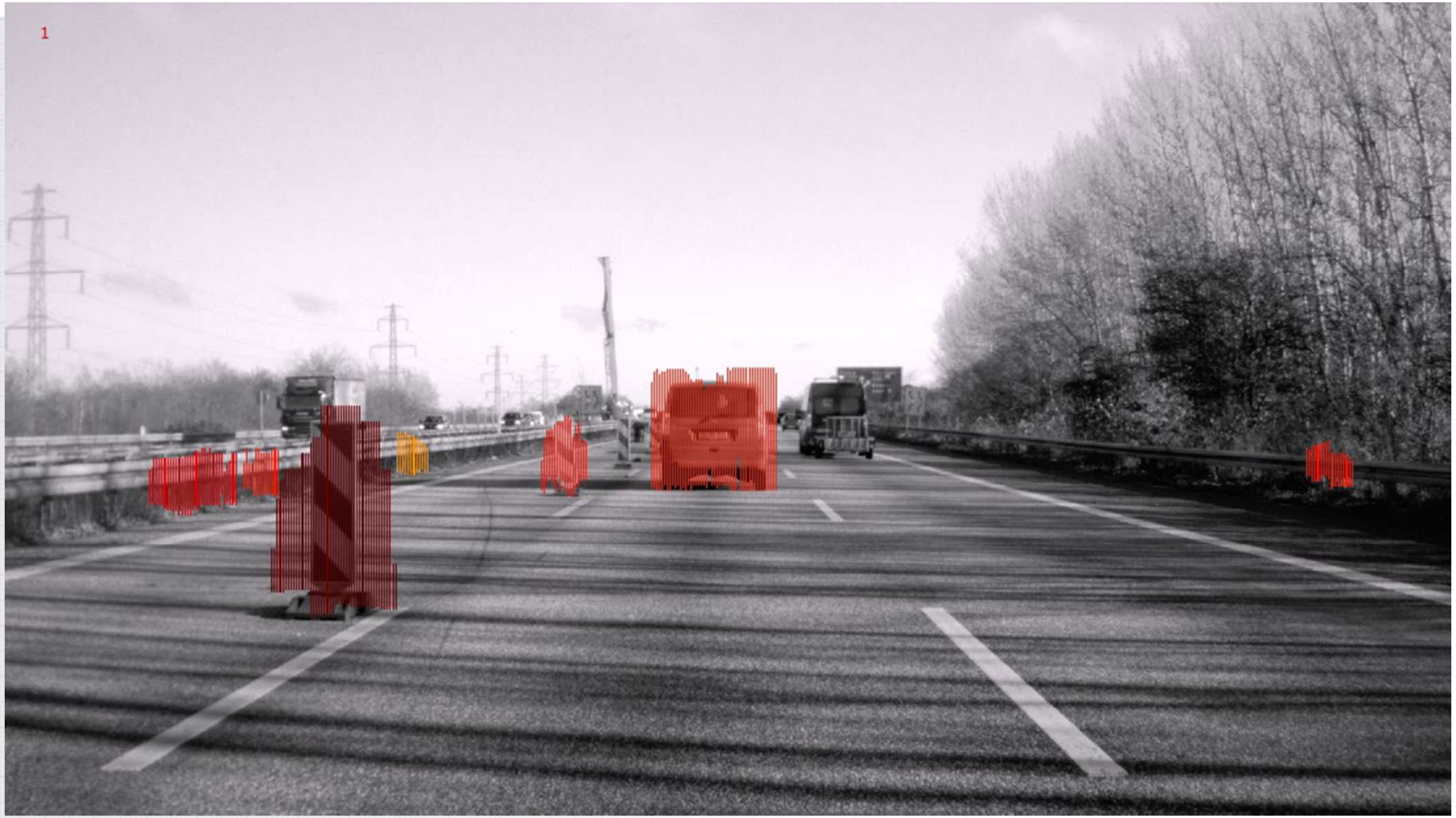
Vision based Pedestrian Detection

Sweden



Autoliv

Stereo vision General Object Detection



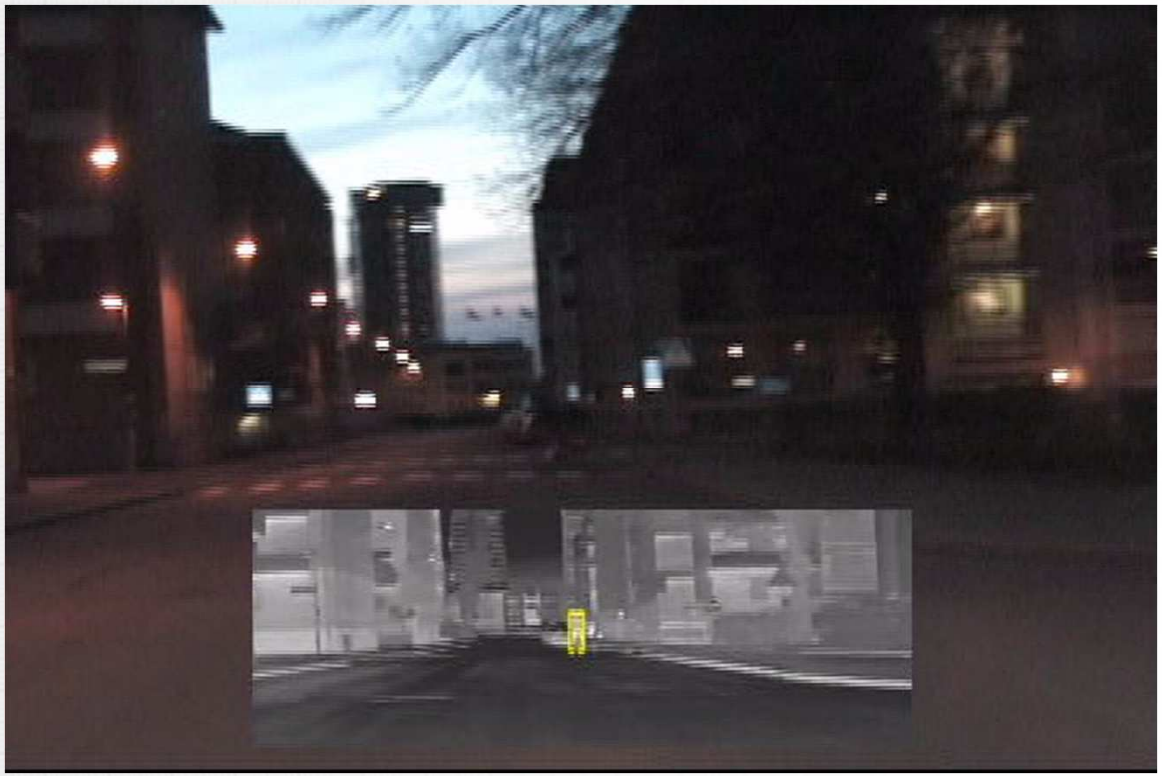
Autoliv

Stereo vision Free Space Detection
Japan, in heavy rain

Autoliv

Stereo vision Road Surface Detection
Europe

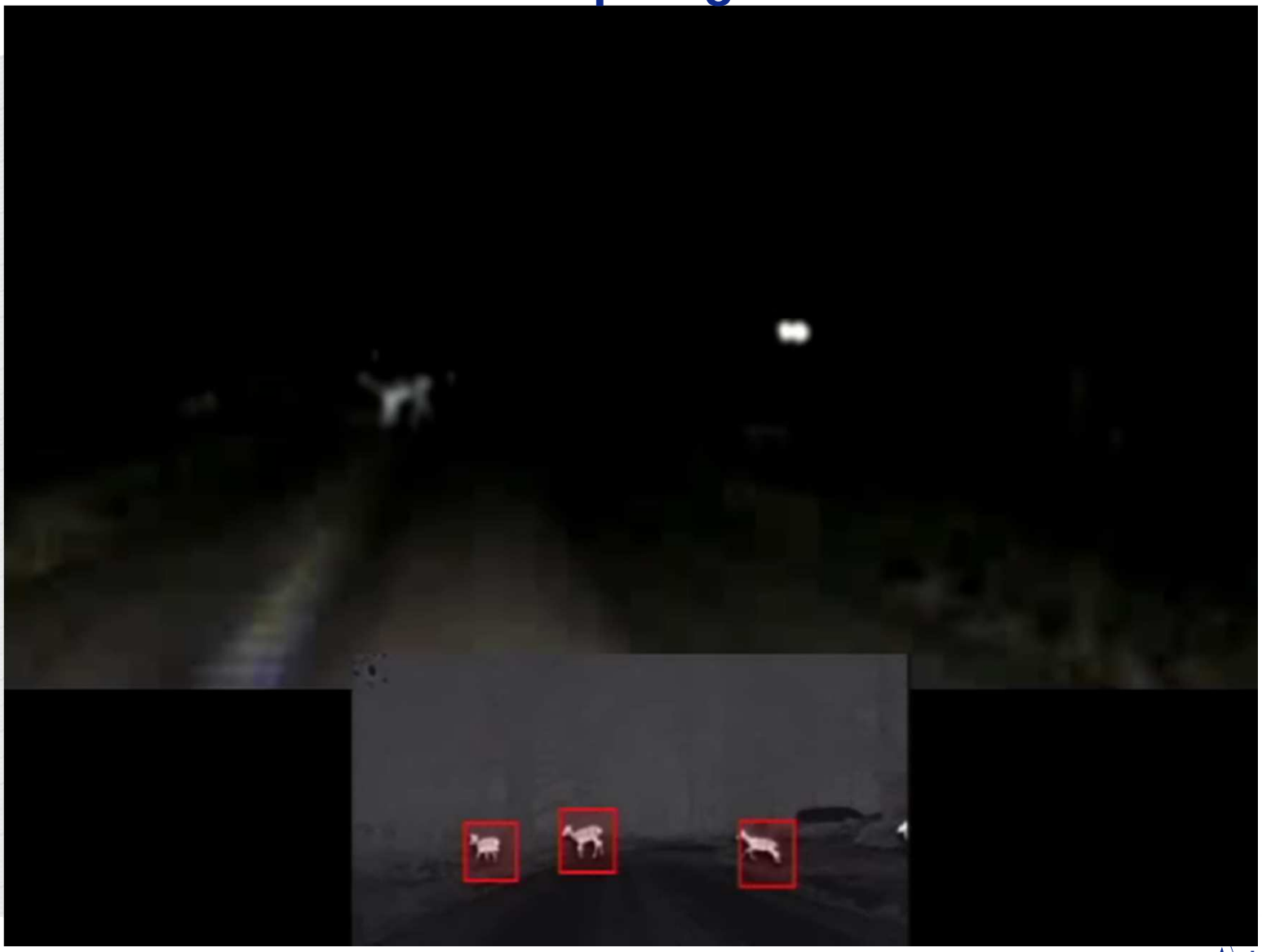
Night Vision



Night Vision with Fusion

Autoliv

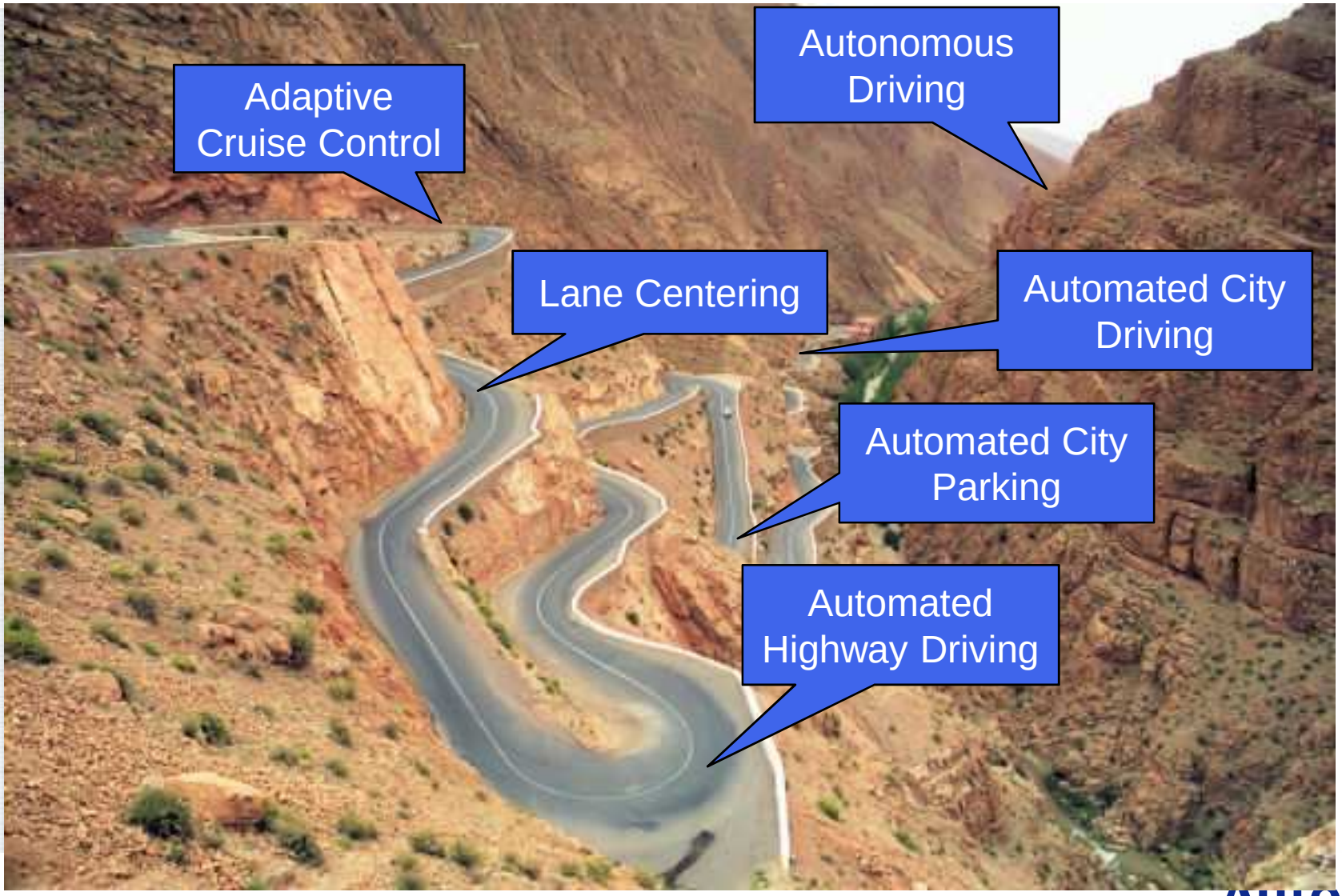
Night Vision
with Animal Detection and Spotlight



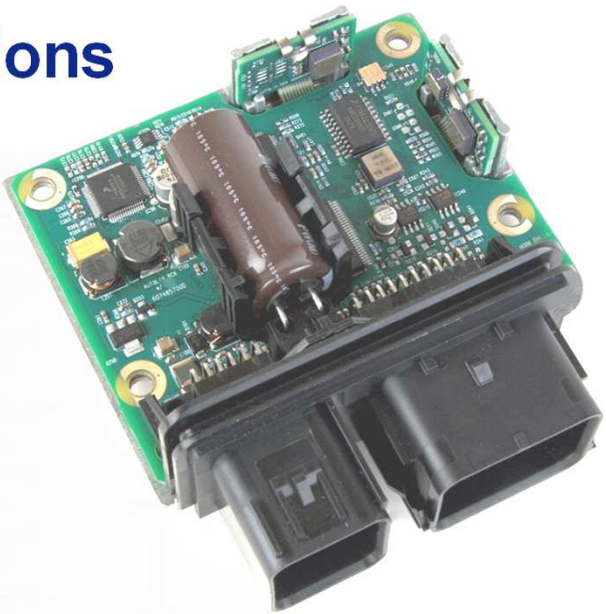
Autoliv

Night Vision

The Road to Autonomous Driving



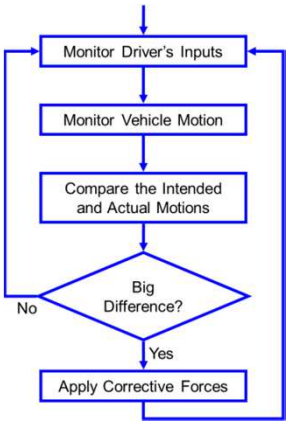
Key Enablers
- System Elements & Design Considerations



Electronic Controllers with powerful microcontrollers and multiple communication ports and fulfill functional safety requirements (ISO26262)

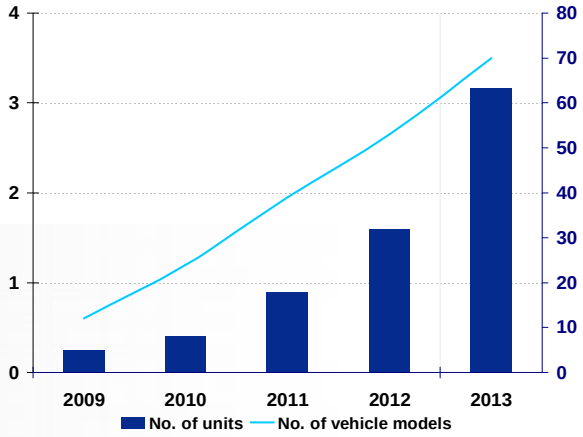
Software / Algorithms for execution of performance feature logic

- Sensor Data Fusion
  - Higher automation and autonomy require multiple sensors
- Reasoning and Decision Making
- Actuation Control
- Operating System

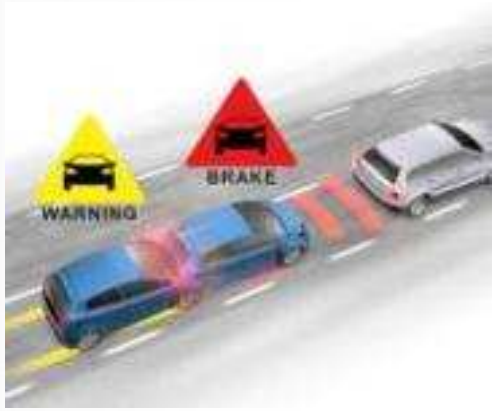


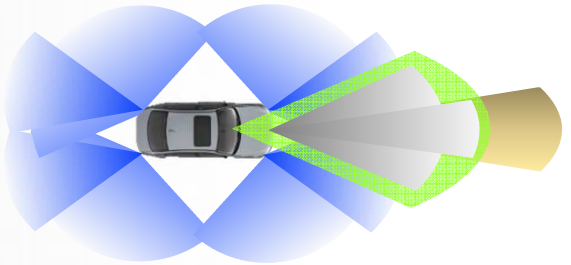
Autoliv

Summary



- Rapid adoption of Active Safety continues
- Automated driving will improve safety, comfort, mobility, and efficiency
- Higher levels of automation and autonomy require more sensors, more controllers, more software, and greater communication bandwidth





Autoliv

Every year our products save over 30,000 lives

and prevent ten times as many severe injuries

Autoliv