TRAFIKVERKET
SWEDISH TRANSPORT ADMINISTRATION

VISION ZERO ACADEMY

STRIVING FOR EXCELLENCE IN TRANSPORT SAFETY

Emerging technologies

Emerging technologies – An important component of Vision Zero

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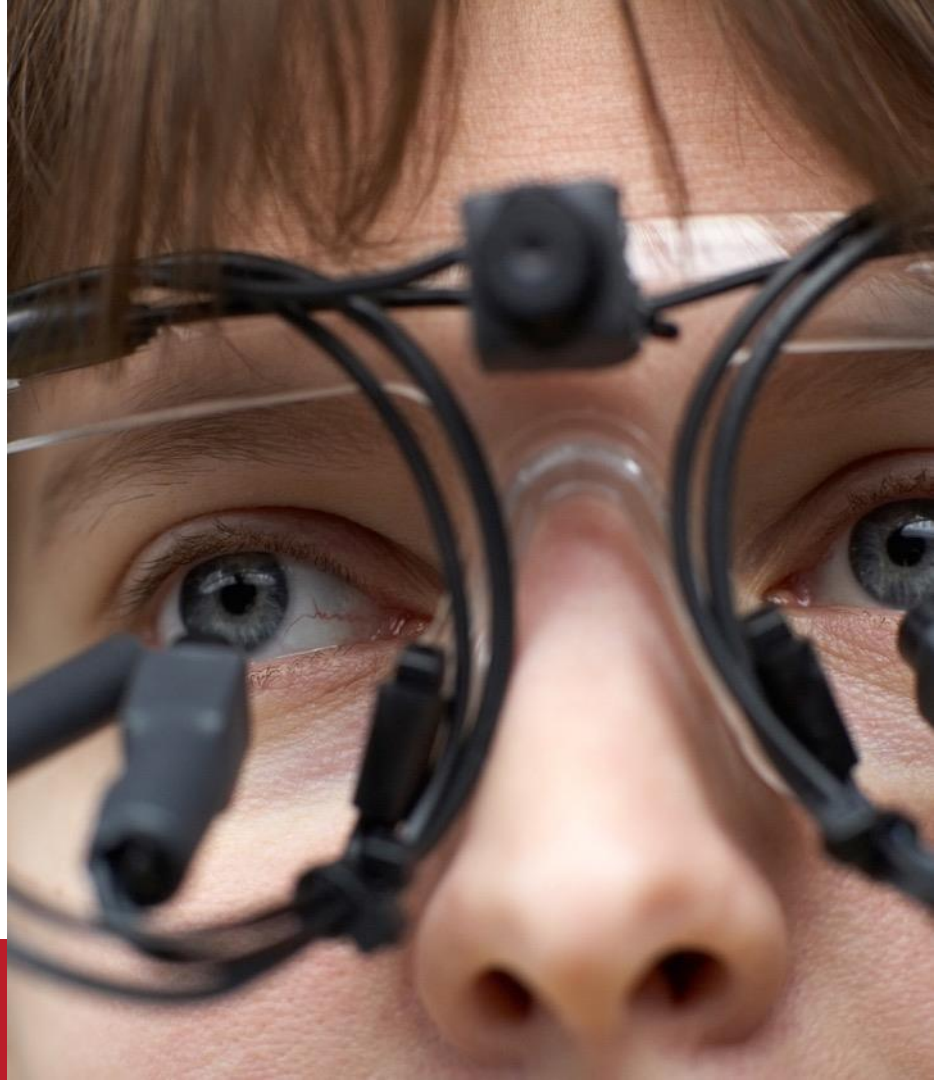
RISE in brief

- Owned by the Swedish government.
- Present across the whole of Sweden. And beyond.
- 2,900 employees, 30% with a PhD. Turnover approx.
- 100s of test and demonstration facilities.
- Our offer:
  - Applied research and development
  - Industrialisation and verification
  - Quality assurance



With our broad range of competencies and unique expertise, we create added value.


Bioeconomy


Fire and safety


Cement and concrete


Certification


Circular economy


Design


Electronics


Energy and fuels


Packaging


Glass


Health and Care


ICT and telecoms


Agriculture and food


Chemistry, materials and surfaces


Life Science


Maritime


Mechanical engineering


Mechanics


Metrology and measurement technology


Paper and Pulp


Process development

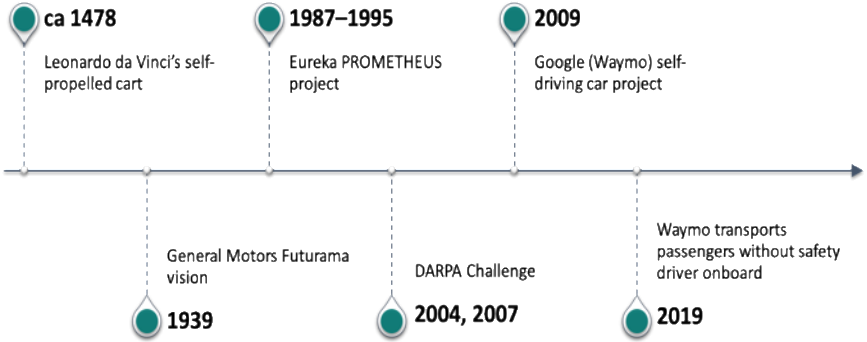

Built environment

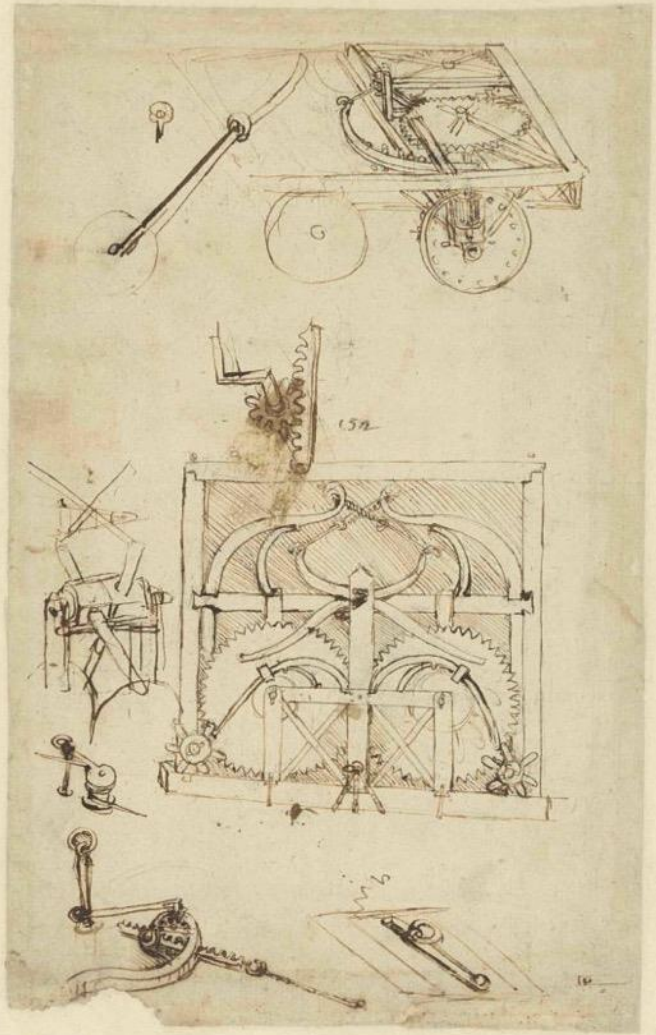

Safety


Mobility


Wood


Water


ca 1478
Leonardo da Vinci's self-propelled cart
1939
General Motors Futurama vision
1987–1995
Eureka PROMETHEUS project
2004, 2007
DARPA Challenge
2009
Google (Waymo) self-driving car project
2019
Waymo transports passengers without safety driver onboard



Known benefits of driver support systems

- Driver support systems adressing vision-related accidents with trucks are 50% more effective in reducing fatalities than re-designing trucks with low-entry cabs.
- Forward collsion warning (FCW) was associated with a statistically significant 22% reduction in the rate of police-reportable crashes per vehicle miles traveled, and a significant 44% reduction in the rear-end crash rate of large trucks.
- Advanced Emergency Braking (AEB) systems show a reduction of 30-54% in the numbers of killed or severely injured pedestrians and cyclists
- AEB has an estimated death reduction of 7% on the EU25 scale with full penetration.
- Combining 12 driver support systems avalible on the market could produce a death reduction of about 50%.

Enhanced ADAS: Improving drivers' experience, acceptance and trust in assistance systems

How can safety, efficiency and drivers' trust in ADAS be improved by integrating real-time information on driver behavior and maps in existing ADAS?

ADAS today

Traffic elements and context

+

Vehicle behavior

- ✓ Faster and more accurate risk prediction
- ✓ Improved performance
- ✓ Reduced accident risk
- ✓ Improved user experience
- ✓ Increased acceptance and frequency of use
- ✓ Stimulate proficient driver behaviour

ADAS in future

Traffic elements and context

+

Vehicle behavior

+

Map information

+

Driver behavior (activities, intent, etc.)

+

Dynamic driver-vehicle interaction (HMI, vehicle behavior)

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smart eye

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SEBRA: Active safety system enabled by radars

Can a radar-based system mounted on bicycles help drivers and bicyclists get better situational awareness?

And now, stakeholders are increasing the level of automation in their vehicles

Improve safety

Improve transport efficiency

Reduce need for new infrastructure

Automation of road vehicles is expected to address our major challenges

Increase productivity

Improve energy efficiency

Increase mobility for those who cannot drive

The efforts are driven by societal challenges and opportunity for profit.

Goods transportation and utility vehicles











- Single trucks on highways and mines, trucks in platoon on highways, docking, utility vehicles
- New types of utility vehicles on predefined roads & in low speeds

People transportation





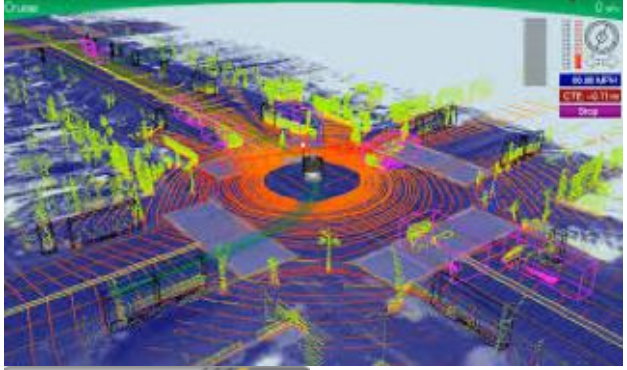
- Selected highways, automated parking
- Regular buses, shuttles
- On-demand shared vehicles
- Flying cars






Start-up companies are redefining the landscape

Technology



Morality & ethics

There are several challenges for automated vehicles

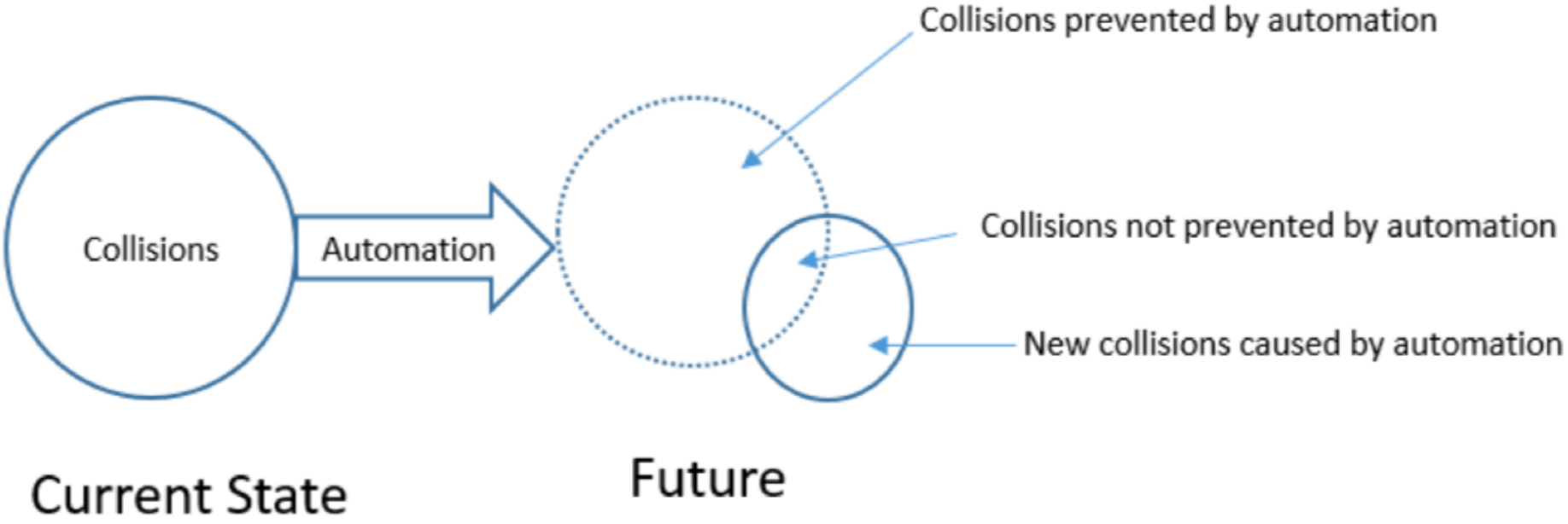
There are still many challenges and some of them are rather tough.

Regulations

Safety

Interaction

Safety as a benefit and a challenge



GLAD: Goods delivery under the Last-mile with Autonomous Driving vehicles

What are the prerequisites for efficient, safe and seamless autonomous delivery of goods under the last mile in a Swedish context?

Low energy consumption

Smart body composition

Simple structure with few parts

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Smart Shared Shuttles

- No steering wheel, no brake and gas pedals
- Safety driver onboard who can give commands via remote control

How do people interact with such vehicles?

Are people willing to use such vehciles?

What if we remove onboard safety driver?

How about using them in rural areas?

eHMI: External Interaction Principles for Creating Trust in Heavy Automated Vehicles

- Is it an AV or not?
- What is the AVs destination?
- What will the AV do next?
- Who is controlling the AV now (the algorithms or a operator in a control room)?
- Why is it standing still (stuck in logic, waiting, sensor failure, etc)?
- Does the vehicle sensors ”see” me?
- Is it safe to approach?
- When should I cross the road?

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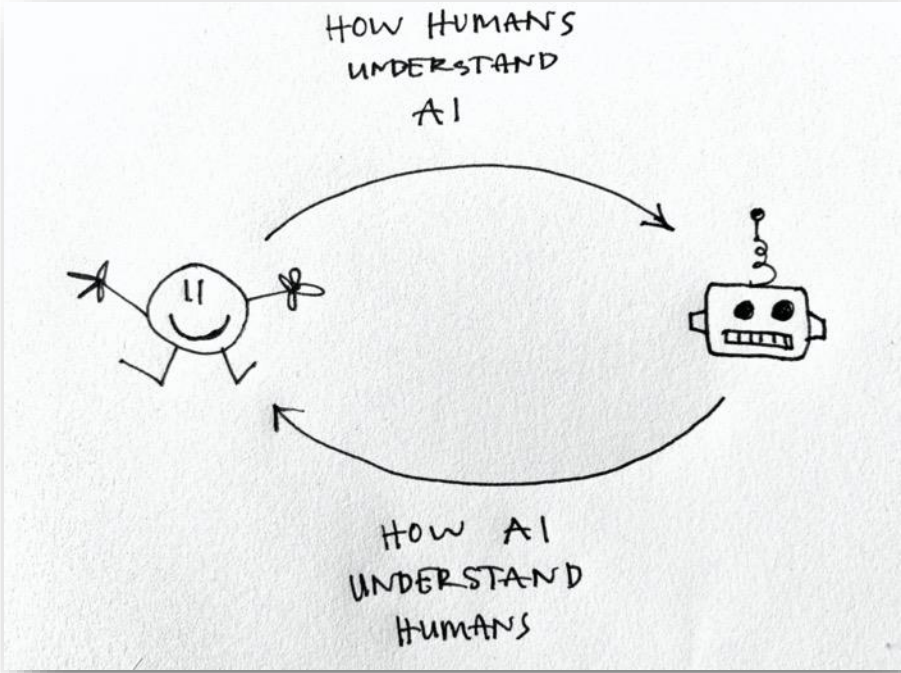
Trust in intelligent cars

How does increased intelligence in and around vehicles affects the trust people have in vehicles when traveling on highways?



VOLVO

HÖGSKOLAN I HALMSTAD

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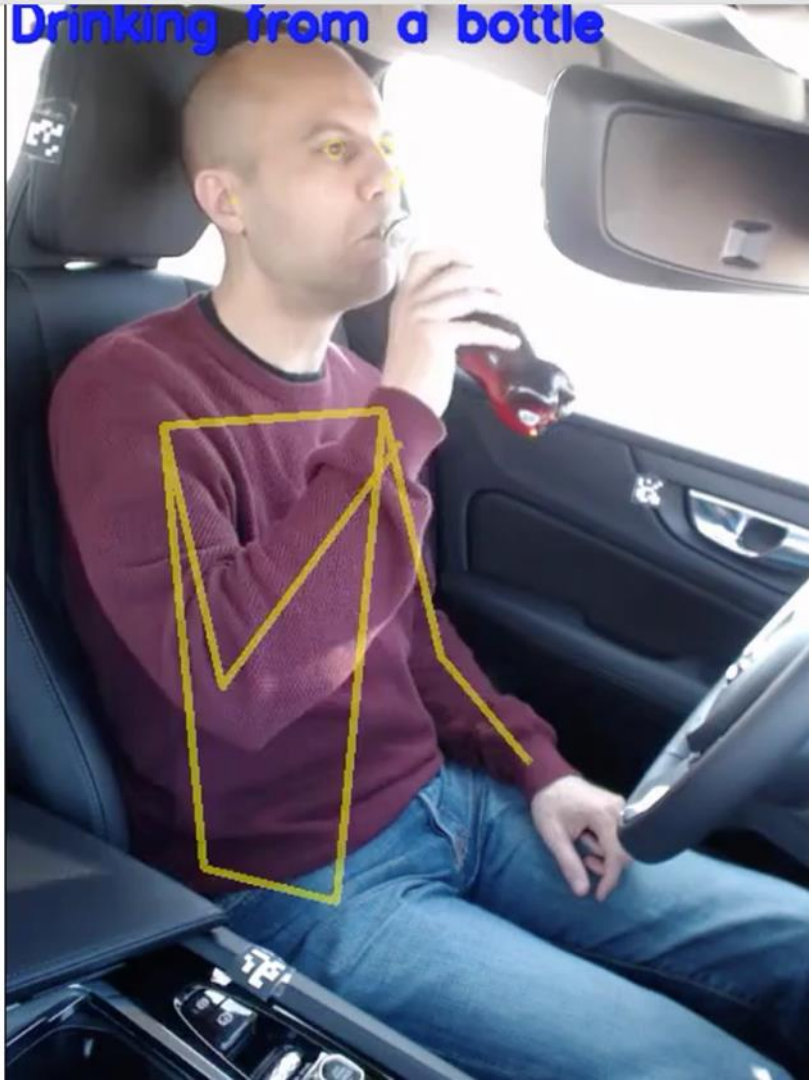
DRAMA: DRiver and passenger Activity MApping

How to automatically map and categorize behaviours, activities and actions of persons in a car cabin?



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smart eye

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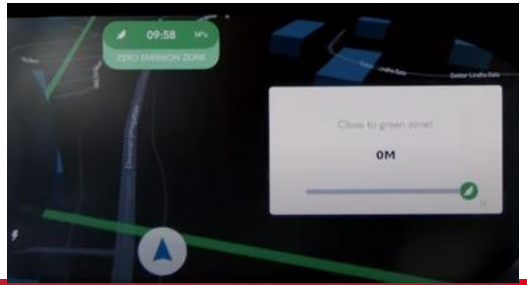
NordicWay

C-ITS pilot projects that enable vehicles, infrastructure and network operators to communicate safety hazards and other information from roads in the Nordic countries between different stakeholders

Emergency **V**ehicle **A**pproaching (EVA)

Time **T**o **G**reen (TTG)

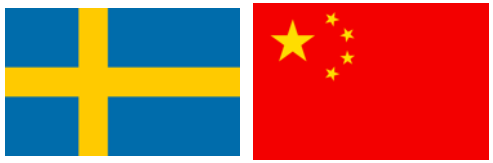
Dynamic **E**nvironmental **Z**ones (DEZ)



Green **L**ight **O**ptimal **S**peed **A**dvisory (GLOSA)

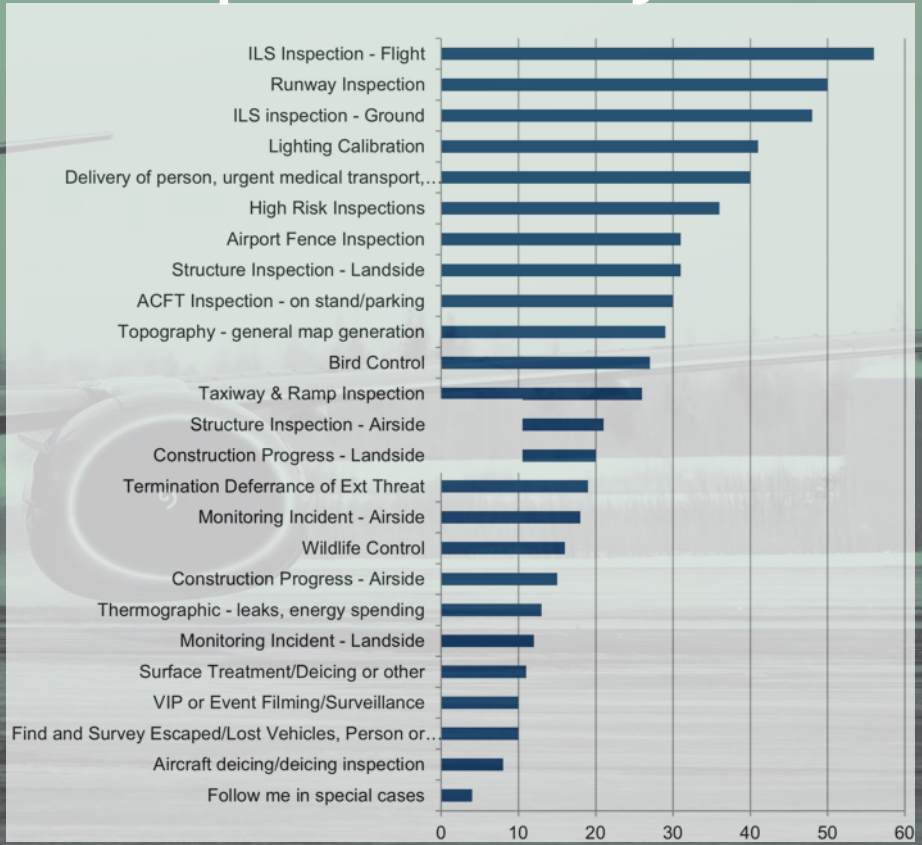
HIEM –Holistic and integrated emergency management under traffic accidents

- Pre-hospital screen to support ambulance decision
- V2X to support interaction between ambulance and other vehicles
- Advanced traffic and infrastructure control to help ambulance with free passage
- Consider both urban and highway environment
- Complementary framework with Sino-Sweden collaboration
- Simulation and public demonstration



Airport Surveillance for Airport Safety

- Many ground operations can be automated
- Inspection, calibration are among the mostly wanted
- ASAS focus
  - Technical foundation
  - Application needs and potential
  - Innovation platform for use cases, and AI



Source: ACI, Eurocontrol

From individual entities towards a cooperative system

AUTONOMOUS VEHICLE

CONNECTED VEHICLE

CONNECTED AND AUTOMATED

COOPERATIVE & AUTOMATED

Principles for integrating emerging technologies into Vision Zero

- Identify local safety challenges for a city or area.
- **Employ small pilot projects** and gradually scale up to larger geographic area.
- **Measure the before and after safety effects.** Collect detailed collision and “near miss” information and use it to **make the case for (not) scaling-up pilots** in the context of Vision Zero.
- **Tell the story to publics to clearly illustrate any safety benefits**, and demonstrate how the new technology can help reach Vision Zero.
- Reference Vision Zero consistently on policy development and strategic decisions regarding the new technology. This will aid in public understanding of this new technology.
- **Adopt a short- and long-term strategy for the new technology** as part of an updated or new Vision Zero plan for your city! Include specific goals, strategies, and benchmarks that lay out rationale, policy levers, and measurement tools that will be applied to execute the plan.

Summary

- By 2025-30, highly automated vehicles may constitute a significant portion of vehicle fleets in industrialized countries.
- Automated vehicles could reduce the number of fatalities and injuries and should be considered as an integral element of Vision Zero.
- BUT automated vehicles will not eliminate all accidents.
- Public-private partnerships will be crucial for implementation of automated vehicles and for warranting safety.
- Incentives for accelerating deployment and use of advanced driver assistance systems are needed.
- Vehicle manufacturers need to find a balance between competing and collaborating on safety.
- New ways of assessing safety are needed.
- New freedom requires new passive safety systems.
- Think globally, act locally: Base future mobility services on local experiences and needs.