

# Active Safety and ADAS

## Driver tasks and vehicle interactions with the environment

### Navigation:

- Route planning
- Avoid traffic jams

### Vehicle guidance:

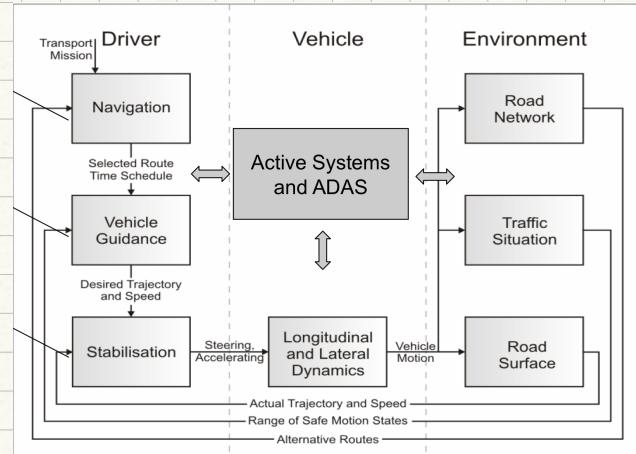
- Maintain desired speed or distance to car in front
- Maintain the drive lane
- Lane change
- Overtaking manoeuvres

### Stabilization:

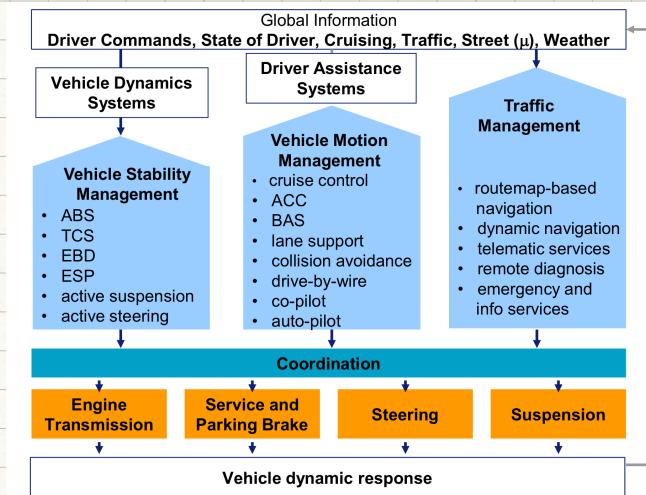
- Maintain the vehicle in a linear region

### Avoid:

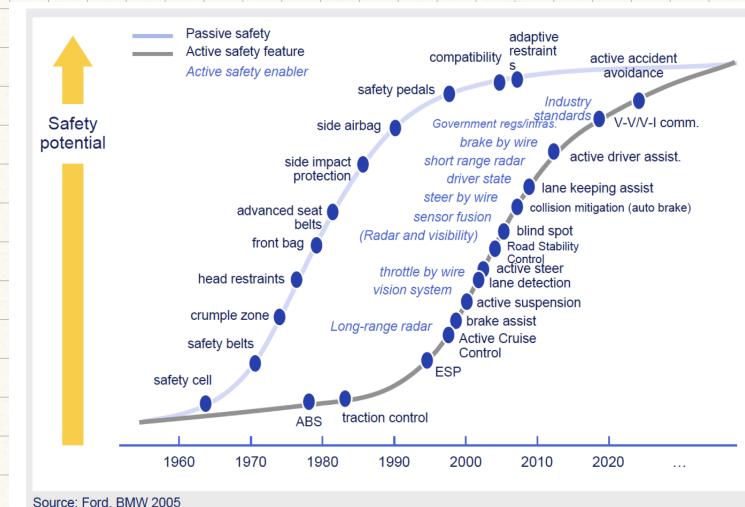
- Excessive wheel spin
- Blocked wheels
- Excessive yaw rate



# Active systems for driver assistance



# Active vs. Passive safety over time



# Active safety systems

## Braking systems

Electronic Brake-force Distribution (EBD):

Electronically distributes the brake hydraulic pressure between front and rear wheels depending on vehicle load and driving conditions

sending relatively more braking power to the axle with the greater load

### Brake Assist (BA):

This system supports pedal actuation during emergency braking by providing additional braking force.

### Anti-lock Braking System (ABS):

Assist drivers in maintaining vehicle control and avoiding wheel lock during emergency stop situations or on slippery surfaces

### Traction Control

#### Traction Control System (TCS):

Combine brake and engine management to transfer power to the wheels with the best grip on the road.

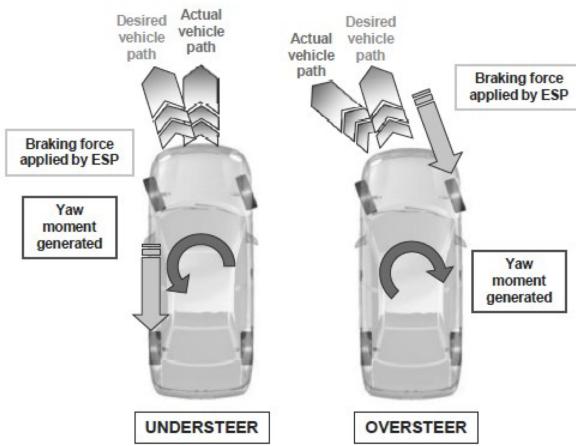
TCS automatically applies the brakes at the drive wheel(s) and reduces engine power, as needed, to help reduce wheel spin during acceleration. This can improve traction and vehicle stability to help maintain control when accelerating on slippery surfaces like slick, wet roads or gravel.

### Stability Systems

#### Electronic Stability Program (ESP):

System that combines the capabilities of ABS and traction control

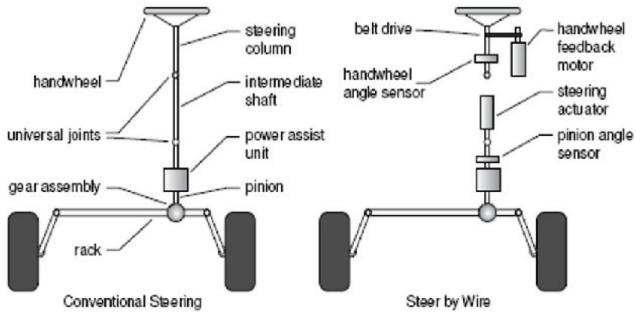
With a lateral stability control feature. While ABS and traction control improve the longitudinal stability of the vehicle by limiting wheel slip, ESP primary function is to enhance vehicle control during cornering.



## Body Control

Through a combination of hydraulic and electronic technologies, the Active Body Control systems limits vehicle load transfer due to body modes of pitch and roll providing enhanced safety. Those kind of systems can act through different suspension elements such as roll bars or actuated damper elements.

# Steer-by-Wire (SBW)



## The 5 levels of Autonomous Driving

	L0 No Automation	L1 Driver Assistance	L2 Partial Automation	L3 Conditional Automation	L4 High Automation	L5 Full Automation
DRIVER						
VEHICLE	Responds only to inputs from the driver, but can provide warnings about the environment	Can provide basic help, such as automatic emergency braking or lane keep support	Can automatically steer, accelerate, and brake in limited situations	Can take full control over steering, acceleration, and braking under certain conditions	Can assume all driving tasks under nearly all conditions without any driver attention	In charge of all the driving and can operate in all environments without need for human intervention