

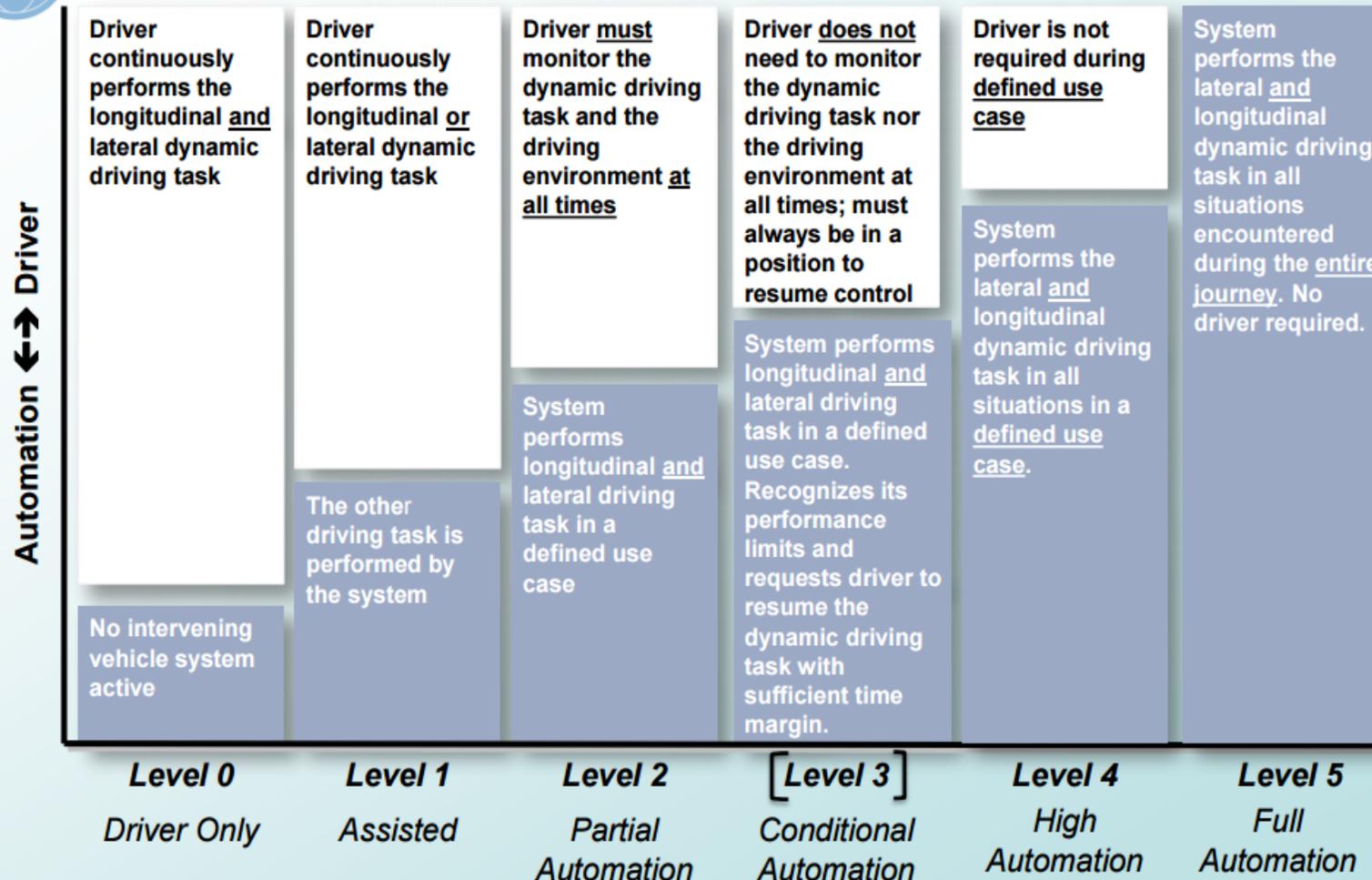
# Autonomous Vehicles

*French Chapter*

*Different levels of automation (delegation of driving) for autonomous vehicles*



## Levels of Automated Driving

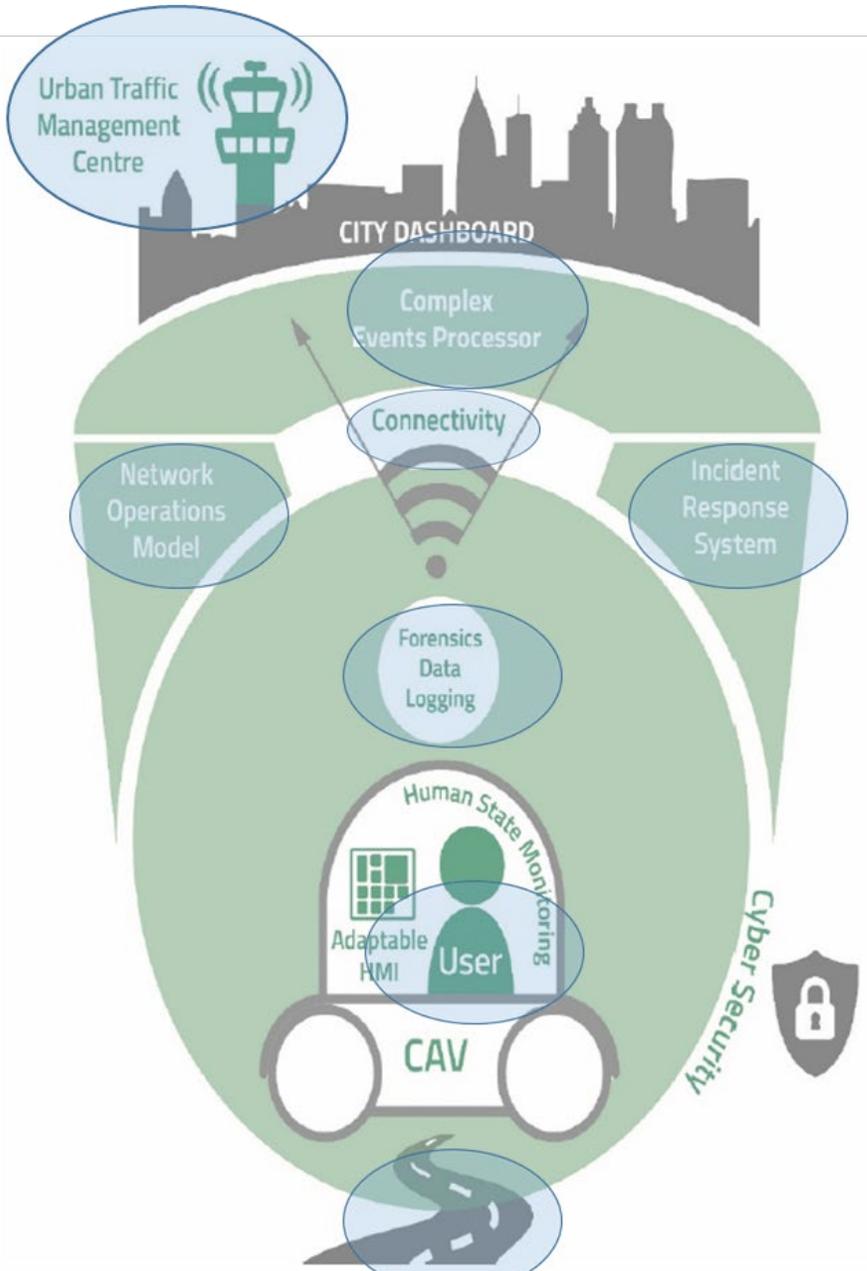


Level of automation\* → \*terms acc. to SAE J3016

- ❖ The driver must be « Eyes on and Hand on » for **level 0 to 3**.
- ❖ The driver must be « Eyes on » and could be « Hand off » for **level 4**
- ❖ The driver could be « Eyes off and Hand off » for **level 5**

**Note:** to resume control could take some seconds (5 to 20 sec ...) for an attentive driver.

# Autonomous vehicle, its environment and the infrastructure



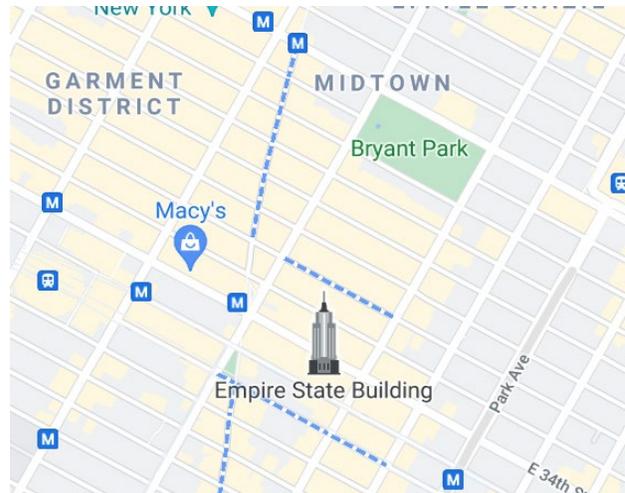
## Different set-up for autonomous driving

Currently, there are two major industrial trends for AVs:

- Vehicles considered as autonomous on a stand-alone mode (more a US trend)
- Vehicles considered as autonomous but highly relying on infrastructures (more European)- Infrastructure need to be equipped by electronic sensors.



Murviel les Béziers- South of France

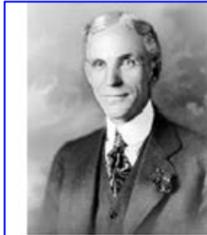


New York city- USA

It is a question of driving conditions

## 1. Insurance industry has always supported innovation and ambitious projects

- ❖ Insurance activities are born when the pyramids were built & they supported the development of the international trade with the Lloyds ... etc.
- ❖ Henri Ford considered that New York City has been built by insurers (Skyscrapers)



[“New York is not the creation of men, but that of insurers. Without insurance, there would be no skyscraper, because no worker would agree to work at such a height, risking a fatal fall and leaving his family in misery. Without insurance, no capitalist would invest millions to build such buildings, that a mere cigarette butt can burn to ashes. Without insurance, no one would drive through the streets. A good driver is aware that he runs every moment the risk of overturning a pedestrian”

## 2. Insurance means indemnity and not liability and reversely

- ❖ The first task is to compensate the claimant when justified
- ❖ Recourse against the liable is done (it could be a step in the process, not a reason to deny a guaranty)
- ❖ Reversely it is not because liability rules are applicable that it is insurable or that insurance firms are willing to support it

## 3. Vienna convention

The legal Framework is still evolving to embark delegation of control (Autonomy).

Geneva and Vienna international convention set rules for vehicle circulation:

- ❖ Article 8.1 of Vienna convention : “All vehicle in movement or group of vehicles in movement must have drivers”
- ❖ From Marsh 2016 onwards, autonomous vehicles with delegation of control under the conditions of disconnection capabilities or regain control possibilities are allowed on public roads.

Countries diverge on the interpretation of the evolution: Has the driver to be hand on (limitation to level 0 to 2 may be 3) to or not (level 4)? For some countries it is not sufficient.

# Some important context points for Motor Insurance

In most countries (Europe as an example- Note that it is the same nearly every were.):

1. **Motor Insurance is not directly linked the existence of a driver or to her/his driving licence.**
  - ❖ The insurance is usually linked to the vehicle and not to the driver – thus insurers already cover Autonomous Vehicles (AVs)
2. **Motor insurance is compulsory**
  - ❖ The EU Motor Insurance Directive (MID) makes the Third Party Liability (TPL) insurance mandatory
  - ❖ The Third Party Liability covers all types of accidents

Therefore, the Motor Insurance Directive provides legal certainty to ensure effective compensation for third party victims of accidents caused by any motor vehicles, including AVs.

Driving condition (delegation of driving) or not does not change the condition of indemnity for the victim. Note that on a same trip, this for some years, a piece of the travel will be done under a full delegation of conduct and the other one under a human driving.



### 3. Subrogation abilities

- ❖ The Product Liability Directive (PLD) offers the insurer the possibility to recover the paid compensation from the responsible producer (e.g. vehicle manufacturer).

# What future for the Motor Insurance? (1/4)

## 1. A strong statement: a vast majority of road accidents are caused by human error

- ❖ US study more than 90% are due to a human error

## 2. No drivers means no human error but does not means a reduction of more than 90% of the claims

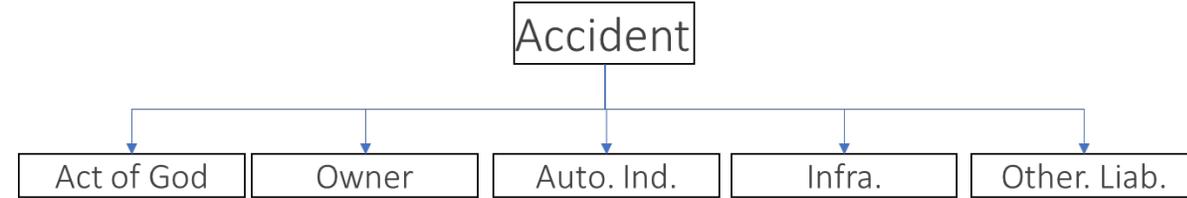
- ❖ Note: some ADAS (Advanced Driver Assistant) are already used on some “classical” vehicle, already impacting the car accident statistics. ( intelligent cruiser, lane controls, emergency braking systems, part assist...)



- ❖ At least at the beginning, the delegation of conduct will be used on “easy” travel: city, highway. Limited impact on statistics
- ❖ Human driver is replaced by computers and sensors: It is a change of risk universe: Human risks could be reduced but new risk needs to factored in circulation risks

### 3. New risks for autonomous vehicles- some example due to a change of “driver”

- ❖ **The Cyber risk:** the main subject is how vehicles, infrastructures and data centers will be interconnected. Depending of the choices taken the issue is different.
- ❖ **IT release:** new subject for the motor industry ...Release opens a lot of subjects: ... Does the vehicle have to be requalified? Will each family/generation of vehicle face a time bar? (technical obsolescence)
- ❖ **Algorithm** are only models with rules, which try to simulate situation:
  - ❖ Emergency systems tries to identify trues and false source of accident: the threshold chosen for false true is a factor of risk
  - ❖ The qualification of autonomous vehicle could be partially done in a process in which algorithm test another algorithm. (An approximation of reality testes another approximation of the reality)...
  - ❖ Which algorithm will decide? On which rational?
  - ❖ Who and how the testing algorithm is certified?
- ❖ **Sensors:**
  - ❖ Are the sensor clean? To avoid ghost ..
  - ❖ Who conflict between sensors will be managed?
- ❖ **Interactions between vehicles, between vehicles and environment (norms?):**
  - ❖ Vehicles will embark a lot of automats. As vehicles will react in correlation to the others, the predictability of the reaction (whatever the models or the brands of vehicles in relationship) must remain predictable. Norms are a key issue: What as an example should be the reaction of an emergency braking system?



## 4. Recourse: a new subject to manage

Level of recourse will increase. No driver will be liable, is a duty to the car users (insurance premium & risk prevention) to do it.

### Different potential cases:

- ❖ Act of God: no responsibility of any one
- ❖ Owner: new responsibility in regard of the maintenance of the vehicle
- ❖ Automotive Industry: The algorithms driving the car could funnel the liability on the car manufacturer and its subcontractors. It is a new field of responsibility for car manufacturing industry (transfer from the driver)
- ❖ Infrastructure: Today very few successful recourse against road, highway in the pre VA situation. In a VA situation, while a majority of road infrastructure are state owned, pending questions include:
  - Does the VA can operate in all situations?
  - ❖ Does the infrastructure need to be secured for the deployment of autonomous vehicle?
  - ❖ Does the infrastructure provide data or information to the car?

# What future for the Motor Insurance? (4/4)

## 5. New project:

- ❖ Train of vehicles are one of the example. The accident potential gravity is dramatically increased.

## 6. Serial claims

- ❖ Car manufacturers already deal with the potential same default on a lot of cars. In the future default could touch security algorithms: time to react will be much shorter
- ❖ Some IT components are produced by few companies.

In nutshell a reasonable bet on the claim evolution could be:

- ❖ A reduction of the number of claims especially smallest one
- ❖ An increase of the average cost (with potentially more heavily injured and less death)
- ❖ The appearance of serial claims
- ❖ Increase of recourses with consequences on the product liability

Will premium grow or decline? Difficult to answer at this stage

## 1. Pricing model will need to embark vehicle features

- ❖ The pricing model will be a composite one using traditional pricing factors, but also other ones related to the vehicle equipment and its performance

As an example, the equipment on a same type of vehicle.

With autonomous vehicles, the type of equipment and its characteristics will be key.

VIN	Forward collision warning	Front automatic braking	Front parking sensors	Rear parking sensors	Rear automatic braking	Blind spot monitor	Lane departure warning	etc
	Equipped	Not Equipped	Not Equipped	Equipped	Equipped	Equipped	Equipped	
	Equipped	Equipped	Equipped	Equipped	Equipped	Equipped	Equipped	
	Not Equipped	Not Equipped	Equipped	Equipped	Not Equipped	Equipped	Not Equipped	
etc	Equipped	Not Equipped	Not Equipped	Equipped	Equipped	Equipped	Equipped	

## 2. Claims handling will be highly data supported

- ❖ Claims data are the raw material for the insurance.
  - ❖ For this reason, insurers claim direct and free access to them in case of crash to understand it. It is also a necessity for recovery and prevention.

Note that these demands are differently supported by the car users- In Europe, drivers' associations are more reluctant than in the USA.

## 3. Data arbitrage between pricing efficiency and cost

- ❖ Note that in one day an autonomous vehicle generates between 5 and 20TB of data (source Quantum) in test conditions –Probably less in standard usage.
- ❖ In one premium, only a few € could finance the data collection and storage... A need to be frugal.

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*Any Questions?*