

Autonomous Vehicles & the Insurance Industry

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Autonomous Car Developments

2013

- Google surpasses 500K miles
- Oxford creates a \$7,750 self-driving car
- Britain tests on public roads
- Mercedes tests on public roads
- CMU tests on public roads
- Audi receives autonomous car license
- NHTSA issues policy on automated vehicles
- DC passes autonomous car law

2011

- Google surpasses 150K miles
- BMW begins testing self driving car on public roads
- NV passes autonomous car law

2010

Volvo CitySafe standard

2007

CMU wins DARPA Urban Challenge

2005

Stanford wins DARPA Grand Challenge

2

2012

- Google surpasses 300K accident free miles
- Nissan opens research facility in Silicon Valley
- Google & Continental receive autonomous car licenses
- FL & CA pass autonomous car laws

2009

- Google begins testing on public roads
- EU launches Project SARTRE



Autonomous Car Timeline: Beginning



2013

2005



Autonomous Car Timeline: Today



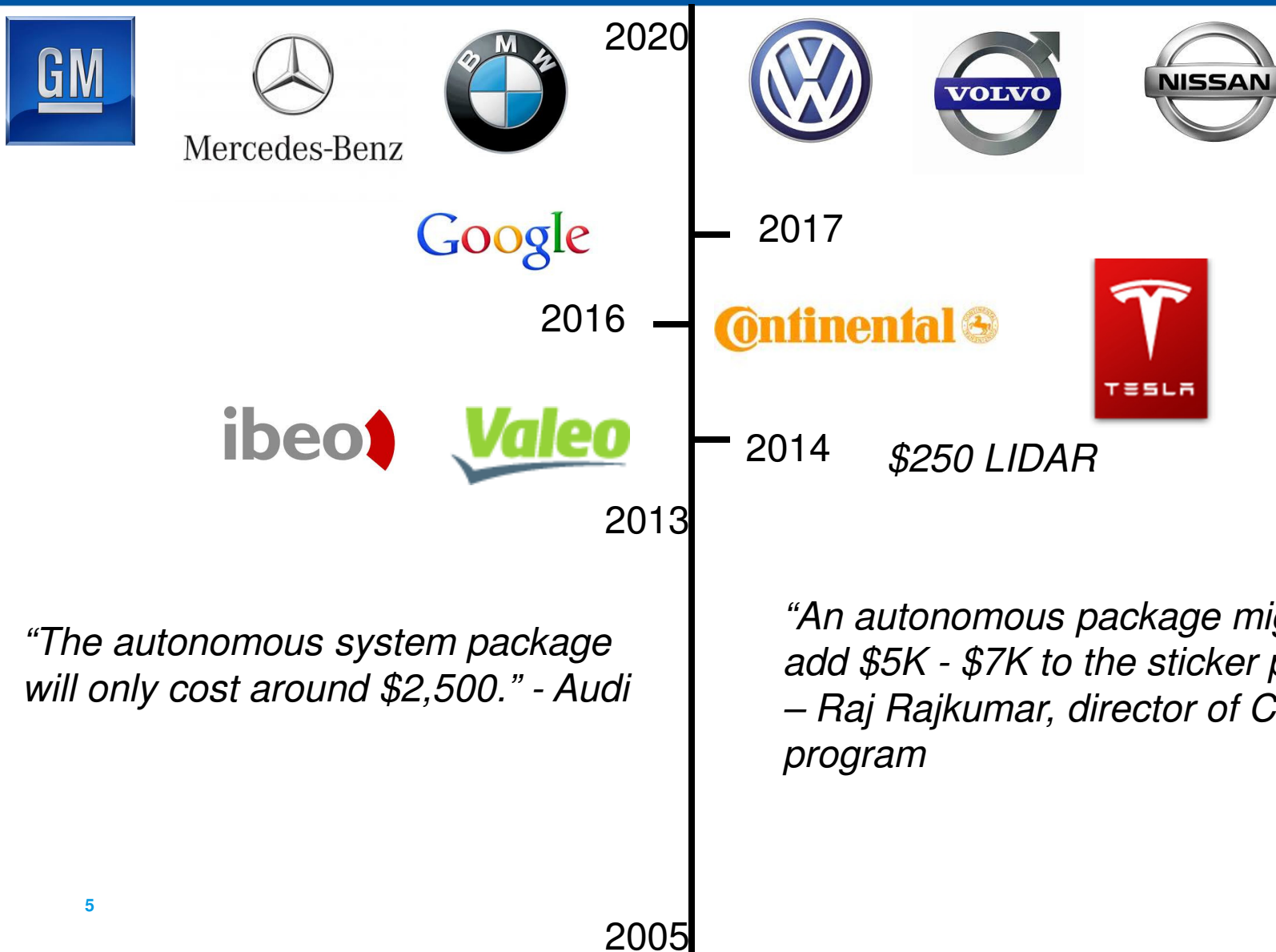
2013



2005



Autonomous Car Timeline: Tomorrow



“The autonomous system package will only cost around \$2,500.” - Audi

*“An autonomous package might only add \$5K - \$7K to the sticker price.”
– Raj Rajkumar, director of CMU’s program*

Current Questions

- **Safety:**

- Are these vehicles safe? / What should the safety standard be?

- **Liability:**

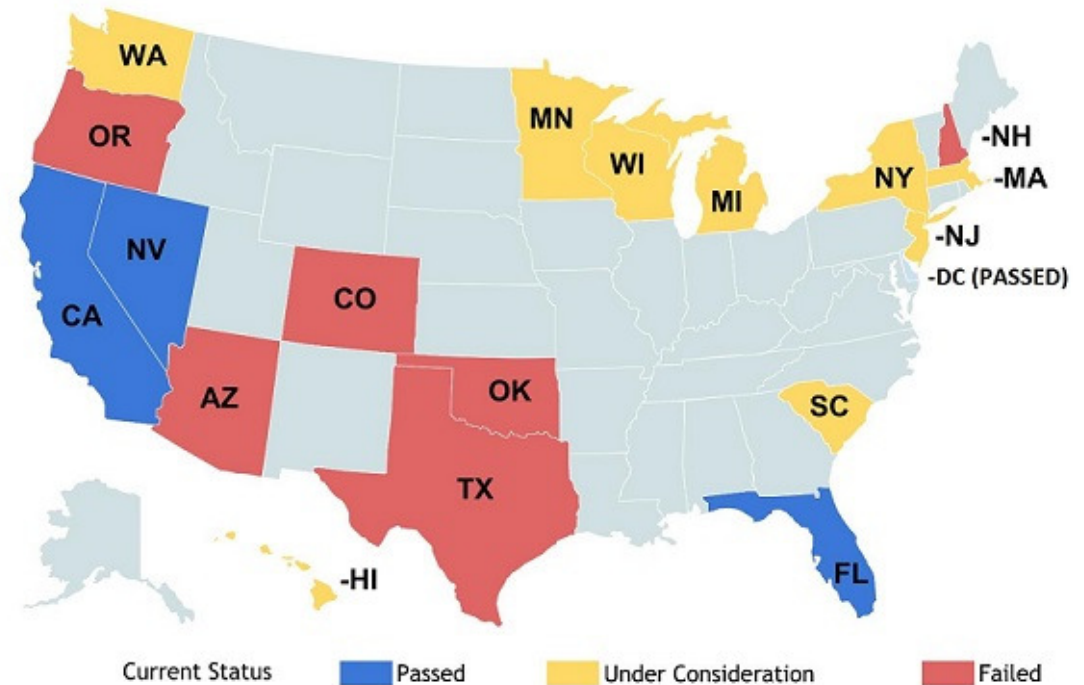
- Who is liable in the event of an accident? / How should we assign liability?

- **Regulations:**

- What regulations should govern the testing and driving of these cars?

Current approach: Overview

- States are passing their own laws, creating a piecemeal approach



- NHTSA issued a preliminary statement of policy on autonomous cars (a suggested approach only)

Current approach: Issues

- **Lower product safety**
 - Less transparency
 - Inconsistent standards between states & companies
 - Unforeseen risks remain untested
 - Encourages risky behavior
 - Inadequate oversight
- **Higher testing costs**
 - 51 separate regulatory codes
 - Duplicate tests required
- **Higher adoption costs**
 - High levels of uncertainty
 - Auto insurance premiums remain high
 - General liability insurance unavailable or unaffordable

Safety Standard: 727K miles

"If an autonomous car travels 727K miles without an accident, we will be 99% confident that it is safer than a human driver."

Poisson

$$P(N = k) \leq 0.01$$

$$\frac{e^{-\lambda} * \lambda^k}{k!} \leq 0.01$$

$$P(N = 0) = e^{-\lambda} \leq 0.01$$

$$\text{Num Miles} \geq -\lambda * \text{LN}(0.01)$$

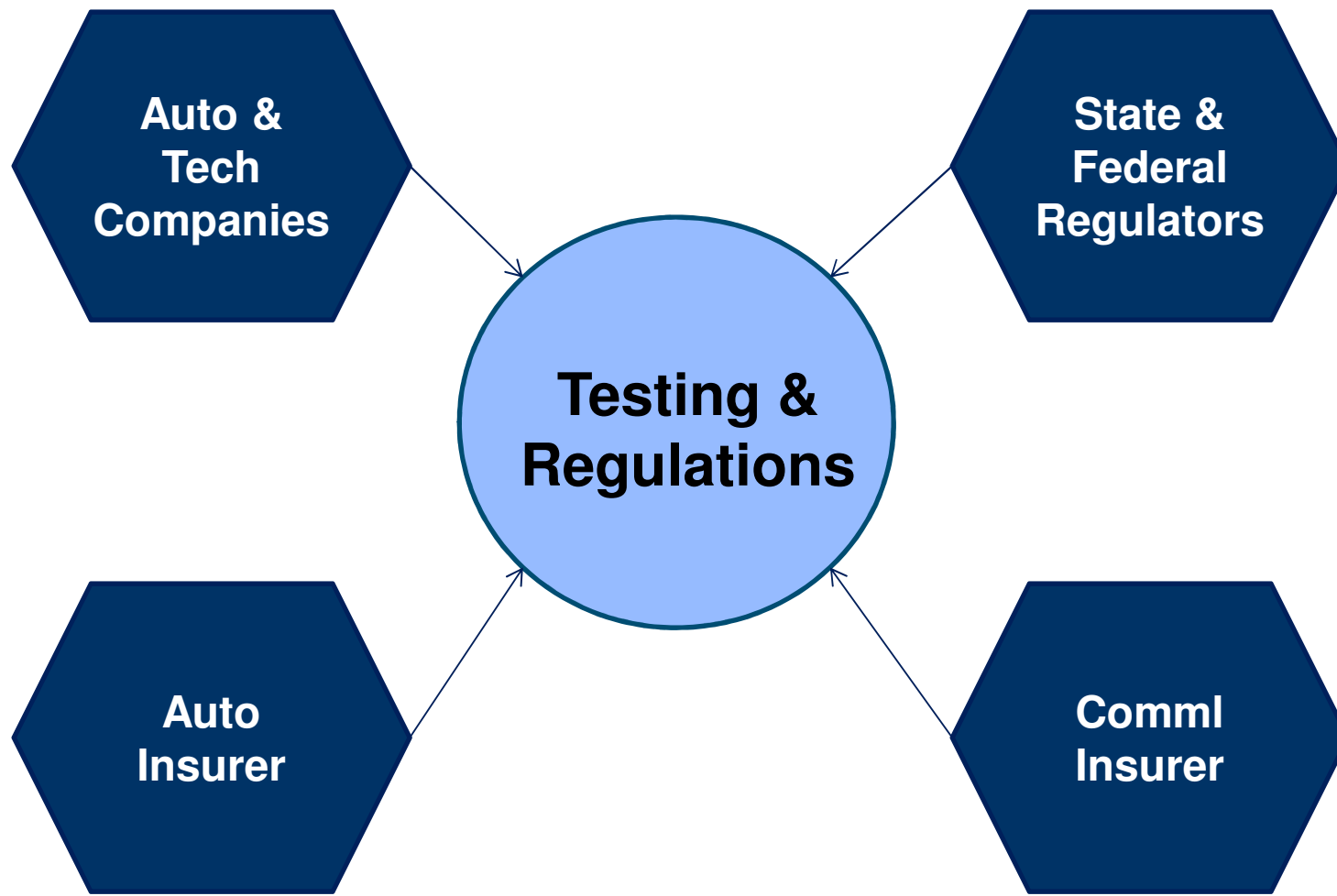
Avg # of miles per accident

- 2010 NHTSA Reported Crashes: 5,505,000
 - 2010 NHTSA Reported Crashed Vehicles: 9,534,000
 - 2010 US Census Bureau Reported & Unreported Crashes: 10,800,000
 - Number of vehicles per crash: $9,534,000 / 5,505,000 = 1.732$
 - Total Number of Crashed Vehicles: $10,800,000 * 1.732 = 18,705,600$
 - Avg # of Miles per Accident:
 $= 2,953,501,000,000 / 18,705,600 = 157,932$
- **99% Confidence = $-157k * \text{LN}(0.01) = 727K$**

Insurance Industry's value

- More detailed accident data & models
- Risk management expertise
- Best understanding of 51 different state driving regulations
- Best understanding of products liability & general liability
- Financial incentive to decrease losses
- A commitment to charge rates that are not excessive, inadequate or unfairly discriminatory

Questions - Optimal approach:

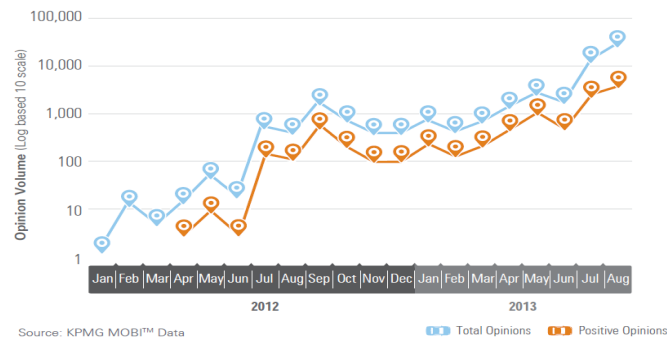


Why Act: Company Benefits



**IMPROVED RISK
PRICING**

Self-Driving Car discussion is accelerating...



**ENHANCED
BRAND IMAGE**

→ The Self-Driving Revolution: Are We Ready?



**IMPROVED
PLANNING**



Why Act: Other Benefits



Final bullet in CAS's Mission Statement:

- to contribute to the well being of society as a whole.

- Number of elderly (>70) is expected to triple by 2030
 - Increase mobility for elderly and impaired



- Human error contributes to 80%-90% of accidents
 - Save 30K American lives and 1.2 mil worldwide lives lost to automobile accidents each year.
 - Reduce 2 million emergency room visits in US & 50 million worldwide non-fatal automobile accidents each year

- Platooning-autonomous road trains-can increase highway capacity by 500% & highway fuel economy by 20%
 - Congestion cost \$121 billion in wasted time and fuel costs in 2011
 - Poor road quality costs drivers between \$335 to \$746 a year in higher car ownership and operating costs.
- 13 ➤ Federal Highway Trust Fund will go bankrupt in 2015

