How Safe Is Safe Enough?
Americans still don’t trust self-driving cars

Nearly 3 in 4 Americans say autonomous vehicle technology “is not ready for primetime”

By Andrew J. Hawkins | @andyjayhawke | May 19, 2020, 12:01am EDT

https://bit.ly/3eqFtRs

Do you trust automated cars? If not, you’re not alone

20 April 2021

by Fintan Burke


In Europe, trust in automated cars is still pretty low. In a 2019 Eurobarometer survey, half of the respondents said they would not use automated vehicles if given the opportunity. Only 2% said they would buy an automated vehicle right away. Image credit: Jan Maddox licensed under CC BY-SA 4.0
Active safety seems to be dominant benefit, not “autopilot”

KEY POINTS

• Cognitive biases may lead to unrealistic safety requirements from self-driving cars.

• Most people require higher levels of safety before agreeing to a ride with a self-driving car than a human driver.

• We tend to regard ourselves as safer drivers than we actually are.

• The safer drivers we regard ourselves as being, the more safety we demand from self-driving cars.
Current Regulatory Strategy

- US Govt. regulates technology
  - State governments regulate/license drivers
  - Regulators have minimal software expertise
  - Vehicle makers self-certify
  - Reactive safety – recalls & litigation

- EU starting to specifically regulate (e.g., ALKS)
  - Type approval based on testing

- Safety primarily via vehicle tests
  - US Federal Motor Vehicle Safety Standards (FMVSS), NCAP
  - EU Type approval tests, Euro NCAP
  - Emphasizes functionality, not software safety
2019 NHTSA data (public roads)
- 36,096 fatalities (1.10/100M miles)
- 2,740,000 injuries
- 6,756,000 police-reported crashes
- *Data includes drunk drivers, speeders, no seat belts*
  - Unimpaired, law abiding drivers would have lower rates

Non-occupant fatalities: 20% (pedestrians, bicycles, etc.)
- Motorcyclist fatalities: 14%

Expect *zero* deaths in a 10 million mile road test campaign
(On average, expect 0.1 fatalities, 0.02 pedestrian fatalities)
Which Driver Are We Better Than?

- ~100M miles/fatal mishap for human driven road vehicles
  - 28% Alcohol impaired/Driving Under Influence
  - 26% Speed-related
  - 9% distracted driving
  - 2% drowsy ...
  (total > 100% due to multiple factors in some mishaps)
  [DOT HS 813 060 & DOT HS 813 021]

- Unimpaired drivers operating at safe speed are much better than 100M miles per fatal mishap

- Fast reaction times do not necessarily ensure safety

https://goo.gl/tEuoaS
ODD Affects “Safe Enough” Value

- Fatality averages for 2019 (IIHS)
  - Location | Deaths/100K people | Deaths/100M miles
  - DC       | 3.3              | MA      | 0.51
  - US       | 11.0             | US      | 1.11
  - WY       | 25.4             | SC      | 1.73

- Fatal crash type
  - DC: highest pedestrian rate (39%)
  - NY, FL, DE: highest bicycle rate (5%)
  - Fatalities per 100M miles: Urban 0.86 vs. Rural 1.65
  - What about day/night, weather, vehicle safety features, etc.?

[IIHS Fatality Fact Sheets State by State; DOT HS 813 060]
“Positive Risk Balance” ➞ AVs kill fewer than human drivers
- What about injuries? Property damage?
- Adjusted for ODD vs. entire human fleet?

What if fatalities have different victim profile?
- Race/ethnicity (skin color, clothing, neighborhood)
- Not a “typical” adult (children, impairments, agility)
- Road use (pedestrians, cyclists, jaywalkers)

Other possible considerations:
- Expected cost (insurance) vs. as low as practicable (ALARP)
- Adverse news events

Standards-Based Engineering Approach

US DOT: “This is exactly the way we wanted standards to be used” per US DOT AV 3.0

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Changing Safety Expectations, Standards & Regulation

- “Safe as a human driver” is complicated
- Expectations beyond simple Positive Risk Balance
- Increasing regulatory pressure to follow standards