The Road Ahead:
Autonomous Trucking and Its Impact on Insurance

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Bio and Introduction

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Overview

1. Background
2. Technology
3. Risks and Insurance
4. Implementation
5. Conclusions/Questions

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Background

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Key Milestones

Global

April 2016
- Truck convoys used autonomous tech to "platoon" across Europe
- Backed by the EU
- Included Daimler, Volvo, Scania, and others
- Longest route was more than 1,200 miles

Intrastate

October 2016
- World's first autonomous truck delivery in CO
- Truck was retrofit with autonomous vehicle (AV) tech from Otto
- 120 mile route from Fort Collins to Colorado Springs

Interstate

February 2018
- First autonomous cross-country truck route
- Truck was equipped with AV tech from Embark
- 2,400 miles from Los Angeles to Jacksonville with minimal human intervention

Source: The Verge / Wired / TheDrive

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What was carried on the first autonomous delivery?

"I used to believe we'd see this stuff in 15 to 20 years, that it would get out slowly"

After witnessing the Otto delivery…

"I drank the Kool-Aid. Is the technology ready? Mostly, yes. It's mostly financial, institutional challenges we face. But I'm moving my 15 to 20 year forecast up to maybe five."

-Dan Murray, VP of the American Transportation Research Institute

Photo: Wired

Source: Wired / TruckNews.com

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Key Milestones Since Then

Look No Hands

June 2019
- First full speed route (up to 55 mph) in traffic with no driver in the cab
- Starsky Robotics used AV tech and remote control 200 miles away to navigate
- 9.4 mile highway route, with a rest area, merging, and changing lanes

Long Haul

November 2019
- Likely first cross country autonomous truck delivery
- Plus.ai designed the truck
- 2,800 miles including night driving, winding roads, and weather (snow and rain)
- Trip took 3 days, only stopping for gas and mandatory driver breaks

Wider Audience

March 2020
- 60 Minutes has a segment on driverless trucks
- Featured interviews and a ride-along with TuSimple
- Possibly first widescale exposure to a national audience

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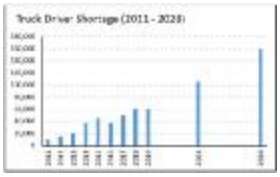
Trucking Industry Today

- Trucks move **71.4% of all freight** tonnage in the U.S.
- Freight volumes have continued to rise since the Great Recession
- **Median driver age is 47** in trucking industry, compared to 42 for all industries
- Shortage of drivers for last 15 years
  - 2018: **60,800 drivers short**
  - 2028: projected **shortage of 160,000**
- Shortage is amplified by the struggle to find qualified drivers
- Causes of Shortage
  - Driver Demographics – Age
  - Lifestyle – Extended Periods Away
  - Job Alternatives



Source: American Trucking Associations / BLS

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Technology

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SAE Levels of Automation

Examples

Level 0: No Automation
- My 2014 Ford Focus

Level 1: Driver Assistance
- 2018 Honda Civic, 2018 Toyota RAV4

Level 2: Partial Automation
- Tesla Model S, Mercedes-Benz CLA Class

Level 3: Conditional Automation
- Concept Audi A8, Concept Google

Level 4: High Automation
- Otto retrofit kit

Level 5: Full Automation
- Doesn't exist, probably won't for awhile

Photo: Vox

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Types of Technology Utilized

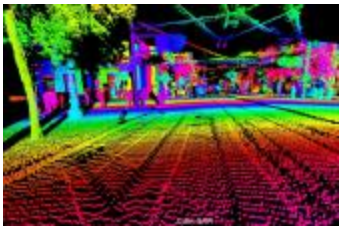

Photo: Motor Trend

- Radar
- LiDAR
  - Light Detection and Ranging
  - Uses infrared laser light to calculate distances, "upgraded Radar"
- High-precision cameras
  - Most accurate, but requires advanced software to identify objects
- Short-range communication
  - Wireless transmitters to communicate with nearby vehicles
- GPS
- Software
  - Processes the signals from the above devices and translates them into actions for the vehicle

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Platooning

- Maintain distance via wireless communication, radar, and GPS
- Primarily performs "straight-line" adjustments
- Alert driver is still needed, especially for direction changing maneuvers
- 5-10% reduction in fuel cost, can be more or less depending on length

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Platooning

Pros
- Fuel savings
- Less roadway congestion
- Reduced accidents

Cons
- Multiple truck accidents
- Prevent other vehicles from changing lanes
- Wireless communications could be compromised

Photo: The Verge

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Retrofit / After-Market Sensors

Photo: Business Insider

Otto's Retrofit Kit included:

- 3 LiDAR units
- Radar
- High-precision camera(s)
- Power steering
- Braking system
- GPS / Mapping data
- Custom computer

Apply to any truck built after 2013

Estimated Price: ?

Source: Wired

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Retrofit / After-Market Sensors

Pros

- Utilize current fleet
- Less frequent stops
- Driver is able to multi-task
- Maybe attract more drivers

Cons

- Risk of software failure
- Not enough real-world testing yet
- May end up costing more than initially anticipated

Photo: Wired

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Originally Manufactured

Pros

- Theoretically more reliable
- Less frequent stops
- Driver is able to multi-task or even be removed from cab
- Possibility for electric

Photos: AutoBlog / Forbes

Cons

- Risk of software failure
- Mostly conceptual / Limited on-road testing
- Could be very costly

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Players in the Autonomous Truck Realm

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Autonomous Trucks During COVID-19

TuSimple

- Making Deliveries for
  - UPS
  - USPS
  - McLane (food delivery)
  - Arizona Foodbank (on a pro-bono basis)
- Routes within and between Arizona and Texas
- Recently partnered with automotive supplier ZF to develop and commercially produce autonomous vehicle technology

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Risks and Insurance

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Major Risks in Trucking

1. Vehicle Accidents
2. Theft
3. Work-Related Injury

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Major Risks in Trucking

1. Vehicle Accidents
2. Theft
3. Work-Related Injury
4. Cyberattacks

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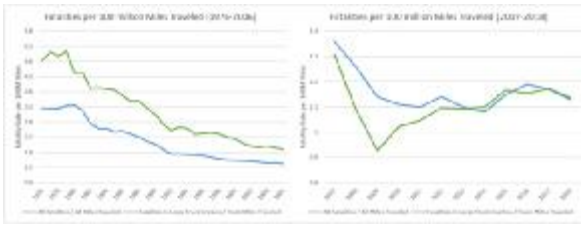
Vehicle Accidents



Source: Insurance Institute for Highway Safety

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Vehicle Accidents

- Driver error causes about 90% of accidents
- About 4,136 people died in large truck accidents in 2018
  - 67% were passenger vehicles occupants
  - 16% were large truck occupants
- Driver fatigue is often a contributor
  - Federal hours-of-service regulations restrict the time on the road
  - Surveys indicate some drivers violate this
- Loaded trucks go 20-40% farther than cars when braking

Source: Insurance Institute for Highway Safety

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Vehicle Accidents w/ Autonomous Trucks

- Driver error causes about 90% of accidents +Reduced but not eliminated
- About 4,136 people died in large truck accidents in 2018 +Less accidents?
  - 67% were passenger vehicles occupants
  - 16% were large truck occupants +Driver may not be in cab or in a safer position
- Driver fatigue is often a contributor +Driver could rest in cab
  - Federal hours-of-service regulations restrict the time on the road
  - Surveys indicate some drivers violate this
- Loaded trucks go 20-40% farther than cars when braking +Quicker response

-Cyberattacks on moving vehicles causing accidents, Terrorism

Source: Insurance Institute for Highway Safety

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Theft

Picture: XtraLease

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Theft

- FBI estimates that $15-$30 billion of cargo is stolen every year
  - Average shipment value stolen is around $200,000
- Most theft occurs within the first 4 hours of a route
- Areas around certain cities and highways are particularly vulnerable
- Many instances of theft committed by drivers

Source: XtraLease / XL Catlin

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Theft w/ Autonomous Trucks

- FBI estimates that $15-$30 billion of cargo is stolen every year
  - Average shipment value stolen is around $200,000
- Most theft occurs within the first 4 hours of a route +Guarantee a 4+ hour start
- Areas around certain cities and highways are particularly vulnerable
  +Easier to continue driving through high risk areas
- Many instances of theft committed by drivers
  +Driverless segments, more external monitoring

-Ransomware attacks

-"Digital piracy"

Source: XtraLease / XL Catlin

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Work-Related Injury

- Injury from vehicle accidents
- Repetitive motion injury
  - Long hours spent in the same position
- Lifting/Overexertion injuries when loading and unloading cargo
  - Improper lifting form, fatigue, and rushing are all contributors

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Work-Related Injury w/ Autonomous Trucks

- Injury from vehicle accidents +Less frequent, less severe
- Repetitive motion injury
  - Long hours spent in the same position +Driverless for long highway segments
    +Possibly able to move around?
- Lifting/Overexertion injuries when loading and unloading cargo
  - Improper lifting form, fatigue, and rushing are all contributors +Driver could rest
    +More likely to be on time

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Cyberattacks

- No documented incidents involving a truck
  - However, autonomous trucks have not been available for public testing

Source: Wired / Green Car Reports

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Insuring Autonomous Trucks

- Some manufacturers have announced that they will accept responsibility for accidents due to malfunction
  - Generally seem to be self-insuring this risk due to lack of coverage options
- At least one insurer has explicitly said that it is willing to write policies for autonomous trucks (AXA XL), others have policies in the works
  - Could include liability, property damage, theft, cyber, care/custody/control, and business interruption
- Manufacturers have shown interest in creating their own auto insurance programs
  - Could help sell AV with limited insurance options

Source: AXA XL

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Insuring Autonomous Trucks

- Changes in underwriting and pricing strategies
  - Shift from focus on driver to focus on technology and maintenance
- Changes in policy language
  - Could lead to policy gaps if not careful
- Speculative Liability Structures
  - Status Quo & Subrogation / Product Liability First / Others

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Implementation

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Benefits of Implementation

- Improved driver experience
  - Multi-tasking
  - Shorter routes
- Increased efficiency / Reduced costs
  - Less down time, fuel efficiency, longer routes
  - Cost savings of 15-20% per autonomous trip (Strategy& study)
- Decreased liability leading to insurance savings
  - Thought to be key for wide-scale implementation
- Corporate responsibility
  - Contributing to safer roadways
  - Reducing carbon emissions

Source: Wired / Strategy& / FleetOwner

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Roadblocks to Implementation

Photo: Wired

- Consistent law changes across states
  - Liability laws don't allow injured individuals to sue manufacturer
  - Following too closely is a moving violation – Platooning
  - Hours of Service will need to be amended
- Poor infrastructure
  - Inconsistent lines and signage can make maneuvering difficult
  - Add connected vehicle technology
- Cost to purchase and maintain technology
  - Upgrades in cyber protection will be needed
- Public Perception
- Weather

Source: Business Insider / TruckNews.com / Trucks.com

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Current AV Legislation

States that Authorize Vehicle Platooning

Legend: Red – No exemptions for platooning vehicles
Yellow – Some authorization w/ restrictions
Green – Full authorization of platooning

States with Autonomous Vehicle Legislation

Legend: Green – Legal
Orange – Legal w/ Safety Driver
Blue – No Legislation

Photos: CEI / Lifewire

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Insurance Complications

- Assignment of risk
  - Is the manufacturer liable? If so, which manufacturer (sensors, software, truck)?
  - Determining percentage of driver error?
  - Was the vehicle properly maintained leading up to the accident?
- Lack of data
- Lack of available coverage
- Structure of Liability
  - Status Quo & Subrogation
  - Product Liability First

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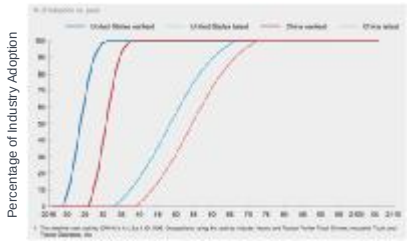
Projected Adoption



Source: McKinsey

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Projected Adoption

Source: McKinsey

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Conclusions

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Conclusions

- Autonomous truck technology – tested, not fully proven
- Reduces the exposure to many trucking risks, but introduces cyber risk
- Could lead to some major benefits: greater efficiency, less liability
- Roadblocks, such as public policy, may hold back implementation
- Insurance response is in early stages and will likely be a key piece
- Opportunities still exist to influence future insurance structures
- Keep this on your radar, wide-scale implementation is closer than it seems

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Questions

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Thank you

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