Telematics Industry HE **DISPATCHER** Insights by Michael L. Sena

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4TH ANNUAL PRINCETON SMARTDRIVINGCAR SUMMIT STARTING DECEMBER 8TH, 2020

This year's summit was originally scheduled to be held in May. It will now be a virtual event held over several consecutive weeks with one session per week. The focus of the 4th Annual Princeton SmartDrivingCar Summit will address the challenges of commercialization and the delivery of tangible value to communities. Conference organizer Professor Alain L. Kornhauser says: "We've made enormous progress with the technology. We're doing the investment, however this investment delivers value only if is commercialized, made available and used by consumers in large numbers to deliver value that is commensurate with the magnitude of the investment made to-date. Initial deployments need to be able to scale."



The Symposium on the FUTURE NETWORKED CAR 2021 A VIRTUAL EVENT - 22–25 MARCH 2021.

The 2020 Future Networked Car Symposium was a hybrid event, held just before COVID-19 caused most of the world to enter a period of restricted travel and remote working. Previous events had always been held in conjunction and co-located with the Geneva International Motor Show. Due to the cancellation of the Motor Show, the event was moved to FNC headquarters where some of the Symposium's participants and attendees gathered, and the remainder took part online.

With the 2021 Motor Show still in doubt, FNC and UNECE have decided that next year's FNC 2021 Symposium will be totally virtual. It will be held on four successive days in March, each day consisting of three-hour sessions dedicated to one of four important topics. The complete program is now ready. See 2021 program at: https://www.itu.int/en/fnc/2021/Pages/default.aspx

THE DISPATCHER

Telematics Industry Insights by Michael L. Sena December 2020 – Volume 8, Issue 2

The Vehicle Fuel Debate Has Been Hijacked

Climate Change and Global Warming are often used interchangeably but have distinct meanings. Similarly, the terms "weather" and "climate" are sometimes confused, though they refer to events with broadly different spatial impacts and timescales.

Weather vs. Climate - Weather refers to atmospheric conditions that occur locally over short periods of time—from minutes to hours or days. Familiar examples include rain, snow, clouds, winds, floods or thunderstorms.

Climate, on the other hand, refers to the long-term regional or even global average of temperature, humidity and rainfall patterns over seasons, years or decades.

Global Warming is the long-term heating of Earth's climate system observed since the period beginning in 1850 to today due to human activities, primarily fossil fuel burning, which increases heat-trapping greenhouse gas levels in Earth's atmosphere. The term is frequently used interchangeably with the term climate change, though global warming refers to both human- and naturally produced warming and the effects it has on our planet. It is most commonly measured as the average increase in Earth's global surface temperature.

Source: NASA - <u>https://cli-</u> mate.nasa.gov/resources/globalwarming-vs-climate-change/

It's time to start listening to the experts

THE FUELS USED to generate electricity, heat interior spaces, power industrial motors and run our land-, air- and waterbased vehicles each have characteristics that make them better or worse at helping to mitigate global warming. The common thinking is: renewable fuel sources such as solar, wind and water are positive; fossil fuel sources like coal, natural gas and petroleum are negative; and, biomass, nuclear, geothermal and hydrogen have their promoters and detractors. Ask a teenager anywhere in the industrialized world to place each of the fuels into one of the three boxes—good, bad or other—and you are likely to find the boxes filled according to the groupings I have described. I chose teenagers as the arbiter group because, as we who were once teenagers know, we were experts in everything and believed we could decide on anything.

Global warming is complex. Its complexity is not easily grasped by the lay person, that is, the majority of us who have not devoted our formal education time to studying the science necessary to understand it. Since it is not scientists but lay persons in the role of politicians that must make the decisions about how laws will be formulated to counteract the negative effects of global warming, it is imperative that the science can be explained in simple terms. Politicians are busy folks who have to make important decisions on many things that affect their constituents (as well as their parties and their personal careers), and in addition to most of them not having the mental bandwidth to understand all the detail, they don't have the time to listen to complicated explanations.

So there are people who have taken on the role of translating the complex science for the politicians. Some are real scientists with a knack for encapsulating complex concepts without losing the essence, but many are amateur, arm-chair scientists, mostly journalists or bloggers—some are even teenagers who have been elevated to the role of expert by promoters—who might have gotten decent grades in high school natural science (when they weren't skipping school to protest global warming) and who have oversimplified (some call it dumbing down) the issues. This simplification has resulted in both the narrowing of the question that is being asked and the trivialization of the answer. It has come down to the following <u>Common Thinking</u> question and answer:

Common Thinking Question: How do we stop climate change? Common Thinkng Answer: Force everyone to drive electric cars.

If there is one lesson we have learned from the past eight months of COVID-19 it is that if you want to stop putting climate-changing emissions into the atmosphere you need to stop doing everything, not just driving, and you especially need to stop generating electricity, stop making steel and concrete, stop heating and cooling buildings where people work, and stop all transport, not just cars but all types of transport vehicles. For me, this was illustrated in a way that I had never seen before in a diagram sent to me by Princeton Professor Alain L. Kornhauser. The diagram was used in a report produced by Alain's friend and former PRINCETON UNIVERSITY colleague, Frederick L. Dryer. He is UNIVERSITY OF SOUTH CAROLINA Distinguished Research Professor of Mechanical Engineering, and PRINCETON UNIVERSITY Professor Emeritus of Mechanical & Aerospace Engineering.



namption of renewable resources [1.e., hydro, wind, geothermal and solar) for electricity in BUT-equivalet values by assuming a typical tossil tuel plant hast rate. of electricity production is actuciated as the total retail electricity delivered divided by the primary energy input into electricity generation. End use efficiency as 65% for the residential sector, 63% for the commercial sector, 21% for the transportation sector and 43% for the industrial sector, which was updated in 2017 to refl DOP* analysis of manufacturuina. Totals may not equad, sum of components due to independent rounding. LiAM-Mi-10327 What's so special about this chart showing estimated energy consumption in the United States in 2019? Technically called a *Sankey Diagram*,¹ it is one of many produced by the LAWRENCE LIVERMORE NATIONAL LABORATORY. In one, simple-to-read chart, it shows all the energy imports by their contribution in quads.² It also shows the principal users of these sources and how much of the energy is actually used and how much is wasted. It is this wasted or 'rejected' energy that is the important addition to this chart. Rejected energy is energy that is returned back to the environment. It has no economic value. It is useless heat.³

The estimated energy consumption in the U.S. in 2019 measured in 'quads' was 100.2 quads. Let's look at Transportation. It uses 28.2 quads comprising 28.14% of the energy consumption. It receives energy primarily from petroleum with minor contributions from biomass, natural gas and electricity. Only 5.93 quads (21% of the energy put into Transportation) are used; the remaining 22.3 quads (79%) are rejected as <u>wasted energy</u>. Electricity generation is not much better: 12.7 quads (34%) are used and 24.2 quads (66%) are wasted rejected energy.

The second chart below shows estimated carbon dioxide emissions in the U.S.. These are for 2018, the latest year for which figures are available. Renewables, geothermal and biomass inputs generate zero contributions to CO₂. The highest contributor is petroleum, and 78% of it goes to transportation. Natural gas is the second largest contributor and nearly equal amounts go to electricity production and industrial uses. Of the total carbon dioxide emissions, transportation accounts for 36.3% while electricity production is not far behind at 33.4%.⁴



2. A quad is a unit of energy equal to 10^{15} BTU, or 1.055×1018 joules (1.055 exajoules or EJ) in SI units. The unit is used by the U.S. Department of Energy in discussing world and national energy budgets. For example, 1 quad is equal to 36 million tonnes of coal or 5.996 billion UK gallons of diesel oil.

3. Rejected energy is "is part of the energy of a fuel - such as gas or petrol – that could be used for a purposeful activity, like making electricity or transport. However, because of the technologies that we currently use to consume fuels, a lot of it gets tossed out by turning it into heat in the environment, which is totally useless. For a coal fired power station, for instance, about 2/3 of the energy released when the coal is burnt is discarded as heat in the environment." https://www.enterprisetimes.co.uk/2020/04/15/rejected-energy-to-think-about/



4. There are charts like this for other countries, but they are not as up-to-date as those for the U.S. An energy consumption chart for China would have over 60% of the electricity generation coming from coal alone resulting in higher carbon dioxide emissions and wasted energy.





vertex between the second seco

What is the question we should be asking?

If we look at the results of both of these charts simultaneously, the real question we should be addressing becomes clear: How can the amount of rejected energy be reduced while <u>at the same</u> <u>time</u> significantly lowering CO₂ emissions? Simply converting all transport from fossil fuel sources to electric sources will significantly increase electricity generation and its concomitant CO₂ emissions, and just transfer the source of wasted energy from transport to electricity generation.

"If we pursue matters objectively, realizing the 'inertias' associated with the energy sector and its universal flow-down more generally to its effects on quality of life, no matter how one chooses to define the term, all must take heed of following approaches that can actually come to pass...not the popular knee-jerk view that given climate change, it is possible to eliminate carbon-containing energy resource consumption by mid-century. Goals should be realistic ones, not ones that are based upon good intentions. If we truly improve overall energy consumption efficiencies (i.e., reduce rejected energy), we can reduce total carbon emissions dramatically while still using current sources, giving us time to put technologies in place (including fusion and the fixing and storing of carbon emissions) to achieve the desirable, long-term goals."

Professor Frederick L. Dryer

Professor Dryer is a proponent of two technologies that reduce rejected energy and reduce carbon emissions. One is for generating electricity and the other is for powering our transport vehicles. Let's look first at electric power generation.

As we have seen from the LAWRENCE LIVERMORE diagram, electricity generation is the most wasteful use of energy. The reason is that today the combustion-based electric power industry uses what is called the *'Rankine cycle'* approach.⁵ The maximum thermal efficiency of a Rankine cycle steam turbine is only 42%, but the practical efficiency is closer to 30%. If all Rankine cycle power generation plants were converted to *combined cycle* turbines, efficiency could be effectively doubled.

A combined cycle power plant uses both a gas and a steam turbine together to produce up to 50% more electricity from the same fuel than a traditional Rankine cycle plant. The waste heat from the gas turbine is routed to the nearby steam turbine, which generates extra power. The gas turbine compresses air and mixes it with fuel that is heated to a very high temperature. The hot air-



Physical layout of the Rankine cycle 1. Pump, 2. Boiler, 3. Turbine, 4. Condenser

5. The Rankine cycle is a model used to predict the performance of steam turbine systems. It was also used to study the performance of reciprocating steam engines. The Rankine cycle is an idealized thermodynamic cycle of a heat engine that converts heat into mechanical work while undergoing phase change. It is an idealized cycle in which friction losses in each of the four components are neglected. The heat is supplied externally to a closed loop, which usually uses water as the working fluid. It is named after William John Macquorn Rankine, a Scottish professor at Glasgow University.

fuel mixture moves through the gas turbine blades, making them spin. The fast-spinning turbine drives a generator that converts a portion of the spinning energy into electricity. A heat recovery steam generator (HRSG) captures exhaust heat from the gas turbine that would otherwise escape through the exhaust stack. The HRSG creates steam from the gas turbine exhaust heat and delivers it to the steam turbine. The steam turbine sends its energy to the generator drive shaft, where it is converted into additional electricity. Other fuels are possible, suggests Professor Dryer, including light, low-sulfur/ash crude oil. This would eliminate the need for refining.

Scrap the Rankines, build Allams and keep the ICE

Professor Dryer suggests that all the Rankine cycle power plants currently operating should be scrapped. They have been written off many years ago, he says, and they are eating up resources for meeting emission control regulations that could be used more effectively by replacing them with combined cycle plants. Longer-term, he suggests that new power generating plants should be built using the *Allam-Fetvedt Cycle* process. The two inventors behind the process are English engineer Rodney John Allam and American engineer Jeremy Eron Fetvedt. The *Allam-Fetvedt Cycle* was recognized by *MIT TECHNOLOGY REVIEW* on the 2018 list of <u>10</u> <u>Breakthrough Technologies</u>. It is a process for converting gaseous fuels into thermal energy, while capturing the generated carbon dioxide and water.

Now to what we should be doing to power our transport vehicles. This is the area where carbon emission reductions need to be made. Over the last thirty years, research and development has helped manufacturers reduce internal cumbustion engine (ICE) emissions of criteria pollutants such as nitrogen oxides (NOx) and particulate matter (PM) by more than 99% to comply with EPA emissions regulations. Research has also led to improvements in ICE performance and efficiency, helping manufacturers maintain or increase fuel economy.⁶ In spite of this progress, spark ignition internal cumbustion engines have a thermal efficiency of just under 40%. Advanced diesel engines are somewhat better at 50%.

A **Reactivity Controlled Compression Ingnition** (RCCI) engine, which runs on dual fuels, has a thermal efficiency of close to 60%. It was invented at the Engine Research Center at the UNIVERSITY OF WISCONSIN, MADISON under the direction of Professor Rolf Reitz. The basic principle of the engine is that it uses two kinds of fuel, one with a high reactivity, such as diesel, and another with the low



Working principle of a combined cycle power plant (Legend: 1-Electric generators, 2-Steam turbine, 3-Condenser, 4-Pump, 5-Boiler/heat exchanger, 6-Gas turbine)

6. <u>https://www.en-</u> ergy.gov/eere/vehicles/articles/internal-combustion-engine-basics reactivity, such as gasoline, natural gas or ethanol. The engine has two injectors, one for low reactive fuel and another for highly reactive fuel. During the first intake stroke, the air-low reactivity fuel mixture is injected into the engine with low pressure. During the compression stroke, the diesel fuel is injected with high pressure. Finally, the whole fuel charge is ignited. The major advantages of this engine is that it results in a 100-fold reduction in nitrogen oxide and a 10-fold reduction in soot when compared with a conventional diesel combustion engine. Fuel savings are up to 20%.

Why haven't we been able to have a discussion of these alternatives? Why did the Common Thinking become the only politically correct thinking? Was it because our politicians have wanted to do something, anything, to keep from being criticized by everyone, including children who have been beknighted by social media users? Those who want to do something/anything chose to adopt a solution that looked achievable, encouraging people to purchase electric cars in the name of stopping global warming. TESLA proved that BEVs work if there is a charging network at strategic locations in addition to the residential charging station. Governments have helped to promote them through tax rebates, sales incentives, lower ownership taxes, special parking spaces and an exemption from paying tolls, and they have not forced the owners to contribute to the road maintenance and building budget that is funded through fuel taxes.

As we have seen, when we look at the actual impacts of switching to electric vehicles we start to understand that we are simply moving the problem, but not getting closer to the solution for global warming. Common thinking advice also recommends doing something, anything, when you don't know what to do. That may work for choosing a pair of red shoes over black ones, but it is not the best advice when the 'something/anything' turns out to be the wrong thing. There is a Chinese proverb, "He who deliberates fully before taking a step will spend his entire life on one leg." No, actually, the proverb should counsel: "He who deliberates fully before taking a step will spend the time it takes to deliberate fully on two legs and will not step prematurely into a pile of horse manure." Part of the deliberation process is finding out, listening to and trying to understand what experts are saying.



https://www.warf.org/media/portfolios/RCCIBrochureV9-FI-NAL-B-HighRes.pdf

Dispatch Central

Just thought you's like to know

While car companies in Europe and the U.S. continue to struggle with COVID-19 effects, the China Association of Automobile Manufacturers reported that sales of new vehicles in the month of October 2020 were 12.5% higher than the same month a year ago, with a total of 2.57 million cars sold. Vehicle sales in China have now grown seven months in a row. Passenger car growth was 9%. Toyota's sales growth was in the double digits.



Here is NIO ES8 with its Lexus NXinspired face and a \$67,000 starting price tag.



The ArcFox Alpha T

Battery Electric Vehicle News

A shortlist of cars on their way West from China

SOME OF THEM are BEVs or HEVs or PHEVs. Some of them will be familiar to readers. I wrote about the *Byton M-Byte* from **Byton** in the <u>September 2020</u> issue, saying that it looked like it would by "biting the dust, maybe". It seems to have survived its management upheaval and claims that it will be reaching the European market in the second half of 2021, first in France, Norway, Switzerland, Sweden and Germany. I also wrote about the former UK icon brand, **MG**, which is owned by SAIC, in the <u>August 2020</u> issue. I said the MG ZS EV "looks more like a knock-off of a *Ford Kuga*" than anything resembling a real MG. BBC's Top Gear says it's "ugly and its electric range is fine for daily use but not for road trips". MG is planning to put it into UK showrooms starting in the 4th quarter, 2020.

Nio, founded in 2014, was listed on the New York Stock Exchange in September 2018. It likes to call itself a 'premium electric car maker' and compare itself to TESLA. Its most notable similarity is the high price of its cars. In 2020, it needed an infusion of \$1 billion from the city of Hefei, China to keep the creditors at bay. It now plans to start to enter the European market, claims its chairman and founder, William Li. The U.S. appears to be on the back burner. Timing of its European arrival is fuzzy.

ArcFox is a BAIC (BEIJING AUTOMOTIVE INDUSTRY HOLDING CO., LTD) sub-brand. It was set up in Catalunya, Spain at BAIC's High Performance Vehicle Design and R&D Center. The idea was that it would be the corporate performance facility for all of the BAIC cars. The car



to the right, the ArcFox GT Race Edition, is one of three cars it presented at the 2019 GENEVA INTERNATIONAL MOTOR SHOW, described by one journalist as having "face-melting power". This is NOT the car that ArcFox is introducing into Europe. That is the ArcFox Alpha T (pictured left), which is the result of a joint venture between BJEV (a wholly-owned subsidiary of BAIC) and MAGNA INTERNATIONAL AU-TOLAUNCH IRELAND LTD. At \$45,000, it will enter a crowded field. No date for a European launch has been announced.

Carl Borgward took over HANSE-LLOYD-WERKE A.G. in the late 1920s and merged it with his GOLIATH-WERKE BORGWARD & CO. It struggled along in Germany, then Argentina and finally in Mexico where production ended in 1970. Carl Borgward's grandson, Christian Borgward, re-formed the company in 2008 as Borgward Group AG in Lucerne, Switzerland. In January 2014, the Chinese FOTON MOTOR COMPANY (a subsidiary of BAIC—are you following this trail of corn kernels?) acquired 100% of Borgward's shares and assets. BORGWARD racked up heavy losses under FOTON. In the first eight months of 2018, the brand lost 1.6 billion yuan after losing 2.7 billion yuan in 2017, according to information FOTON disclosed last year. In March 2019, Chinese taxi and short-term-rental provider UCAR acquired a 67% stake in Borgward for 4.11 billion yuan (\$614 million). That stake had been purchased by consultant CHANG-SHENG XINGYE ENTERPRISE MANAGEMENT ADVISORY three months previously for 3.97 billion yuan. No date has been set for the introduction of the BX7 in Europe. It is not an electric vehicle.

It's called the *Lynk & Co 01*, and it's based on the same Compact Modular Architecture (CMA) used by the *Volvo XC40*. In fact, the 01 was developed in Gothenburg, Sweden, at the shared GEELY and VOLVO Research and Innovation Center. **LYNK & Co** believes that trim levels and option packages are "pointlessly complex," so it built the *01* with an "everything extra comes standard" philosophy. Buyers only need to specify the color of black or blue and choose a hybrid (HEV) or plug-in hybrid (PHEV) drivetrain. *Autoweek*

reports that a LYNK & Co 'mobility membership' will cost €500 per month when they start to be delivered to customers in April 2021. This price includes insurance, tires, repairs and service. No dealers, just 'clubs' where LYNK & Co members can hang out. Cool.

GREAT WALL MOTORS, the company responsible for bringing the **ORA R1** to life, says that ORA stands for 'open, reliable and alternative'. It is aimed at the young and upcoming city dweller. Its price, around \$10,000, is its main selling point. GWM claim it is the cheapest EV on the planet. Management say that the ORA R1 will be coming to Europe, and it is committed to setting up a factory in Europe when deliveries from China reach 50,000. I think the first step will be to get the little imp through the vehicle Type Approval process.



There's not much more we can say about this car that its picture doesn't say.



The Borgward BX7 really does look like any other SUV. Just what the European market needs.



Polestar leaves its Swedish heritage behind

POLESTAR STARTED LIFE as *Flash Engineering*, a racing team competing in the Swedish Touring Car Championships. It was sold and rebranded *Polestar Racing* and began engineering its own racing Volvos in late 2000s. In 2009, before Volvo CARs was sold by FORD to GEELY, the brand became an official Volvo partner that modified cars under the name *Polestar Performance*, like AMG for MER-CEDES-BENZ. In October 2017, Volvo CARs announced that *Polestar* would become a standalone brand focusing on electric cars. Initially, it was a sub-brand of Volvo. In 2018, it became its own company with 50% controlled by Volvo CARs and 50% by ZHEJIANG GEELY HOLDING GROUP, the parent of Volvo CARs.

POLESTAR builds its cars in China in two plants for the local market and for export to Europe and the United States. The low-volume *Polestar 1* plug-in hybrid coupe is made in Chengdu and the *Polestar 2* full-electric sedan is built in Luqiao. In the future, POLESTAR will get electric vehicles from a new plant that ZHEJIANG GEELY HOLDING plans to build in Chongqing, China run by a wholly owned, newly registered company, according to documents on its website, and will have a capacity of 30,000 EVs.

The lineup will be expanded to add an SUV, the *Polestar 3*. Then will come the production version of the *Precept* full-electric grand tourer, which POLESTAR CEO Thomas Ingenlath said will be in development for another three years. The *Precept* was first shown in September at the *BEIJING AUTO SHOW*. It was supposed to have been revealed at the 2020 *GENEVA INTERNATIONAL MOTOR SHOW*, which was cancelled. It will be built at a new plant in China, POLESTAR has said.

For several years now, VOLVO has graced the bus stop advertising panels, magazine and newspaper ad pages with its slogan MADE BY SWEDEN. With all of its POLESTAR cars and all of its VOLVO electric cars being produced in China, and with its declared commitment to electrify its entire fleet in the near future, it's probably time for VOLVO to update its ad to MADE BY CHINA.

...and here's one from Croatia.

RIMAC IS NAMED after its founder and owner, Mate Rimac, a 32year-old who started RIMAC AUTOMOBILI in 2009 in Sveta Nedelja, Croatia. He has designed and built an electric car that Alex Roy, who holds the US Cannonball Run transcontinental driving record and is the founder of Human Driving Association, tested for an



Is it time to update the slogan to MADE BY CHINA?



episode of the NBC SPORTS programme /*Drive* that aired on October 26, 2017. Alex said: "I haven't driven anything this fast in my life. Absolutely changes the game." The 150 *Rimac C Two* models that were built sold out as soon as it was shown to the public in 2018, in spite of its cost: \$2.4 million. The next batch will be ready sometime in 2021.

What is more interesting about the company is that its main business is evolving into serving as a supplier of lightweight battery systems and electric vehicle technology, and constructing battery packs, cooling systems and management software to deliver the best combination of power for speed and energy for range.⁷ RIMAC has attracted investments and collaboration agreements with PORSCHE, KIA, HYUNDAI, ASTON MARTIN, KOENIGSEGG, RENAULT and SEAT.

Since Mate Rimac has already delivered cars that have the ultimate car guy, Alex Roy, enthusing, and has other car companies using his technology, I don't think I will have to write an update to this story like the one I did for NIKOLA in the <u>November 2020</u> issue of *THE DISPATCHER*.

Self-driving and Data Sharing News

UK insurance group criticizes plans for self-driving cars

THATCHAM RESEARCH, a UK group funded by insurance companies, has criticized the British government's plans to allow 'self-driving' cars on motorways as soon as 2021. THATCHAM states that "this would put lives at risk because the available automated technology falls well short of human driving capabilities". The reason this has occurred now is because the UK government closed a consultation on the 27th of October, and THATCHAM is concerned that the report will recommend some form of 'automated' driving on British motorways.⁸ It appears the focus is on allowing the use of Automated Lane Keeping Systems (ALKS) that would permit drivers to take their hands off the steering wheel and let the vehicle to drive itself.

Matthew Avery, THATCHAM's research director, says: "We don't believe that this technology adequately addresses what consumers will do and how they'll use it." He says that the systems may not be able to see debris on the road, avoid pedestrians or recognize when a motor way lane is closed. "There are liability and legal challenges with ALKS, as well as safety challenges about your vehicle not being able to do what an engaged human driver can do," Avery said. "The technology just isn't there yet, regardless of what the manufacturers say." 7. *THE ECONOMIST*. August 22nd 2020. *Believe the hypercar*.

In case you missed it

German Umweltbundesamt (Federal Environment Agency) states that Tesla must pay a fine of over €12 million (\$14 million) because it did not fulfill its battery take-back obligations. All manufacturers are required to take care of the end-oflife battery products. In the case of EVs, those might be faulty batteries, old batteries (low capacity), or packs damaged in accidents. Tesla, of course, has denied wrongdoing and has, of course, filed an objection. We shall see if the German government caves in as easily to Tesla's tactics as its U.S. counterpart.

8. When we went to press, the final consultation report was not published. Here is the Call for Evidence for the Safe Use of Automated Lane Keeping System (ALKS) produced by the UK Centre for Connected & Autonomous Vehicles. https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment data/file/921409/Safe-Useof-Automated-Lane-Keeping-System-ALKS-Call-for-Evidence-FINALaccessible.pdf The problem for the insurance industry, claims Avery, is that <u>if a</u> <u>driver is not in charge of a vehicle</u>, he or she would be classed as a passenger. This would create additional liability for insurers and could lead to higher premiums. Avery said that "within around five years self-driving systems will be able to handle motorway driving, but calling today's systems 'automated' is misleading for drivers; 'assisted driving' is a more accurate term". He referred to accidents drivers have had using TESLA's *Autopilot* system. "We've seen people doing stupid stuff with TESLAS, getting in the back of the car when they feel it's automated when it's clearly not."

THATCHAM is not alone in wanting a more careful and considered approach to releasing new technology on public roads. MERCEDES-BENZ has publicly stated that it wants its engineers, not the public, to test what it calls "still-experimental" systems. This is in sharp contrast to TESLA which has been using its customers as beta testers, a practice I have repeatedly criticized as irresponsible.

Massachusetts independents win on data sharing

THE RECENT US election was not just for deciding who would occupy the White House and get to make policies affecting everyone on the planet. There were elections for both U.S. and State senators and representatives, state governors, mayors and many other political offices. There were also so-called 'ballot questions' or 'propositions', like Proposition 22 in *The State of California* asking citizens of the state whether they want Uber, Lyft and other selfemployed taxi drivers to be designated as independent contractors as Uber and Lyft wish. Voters voted "yes" and thereby supported the Uber and Lyft position. In *The Commonwealth of Massachusetts*,⁹ *Question 1: Vehicle Data Access Requirement Initiative* was put to the voters. 75% of the voters voted "yes" to it.

What does it mean?¹⁰ This measure amends and broadens a law already on the books that gives consumers in Massachusetts the right to repair the vehicles they own at independent workshops. This new measure when signed into law will require automakers that sell vehicles in the state with telematics systems (i.e., have the ability to send data via a wireless connection) to equip their vehicles with a <u>standardized open data platform</u>. The measure states that this must be done for cars beginning with model year 2022. This is not technically possible. More time will be needed to implement such a system, but it gives a clear indication that service providers are serious about gaining access. This is the other side of the issue I wrote about in the <u>November</u> issue of *THE DISPATCHER*. It is the side that I will cover in depth in January.



9. Massachusetts, Pennsylvania, Virginia and Kentucky use the term 'commonwealth' in their State constitutions as part of their official names. 'Commonwealth' does not describe or provide for any specific political status or legal relationship when used by a state. Those that do use it are equal to those that do not. It is a traditional English term for a political community founded for the common good, and is used symbolically to emphasize that these states have a "government based on the common consent of the people" as opposed to one legitimized through their earlier colonial status that was derived from the British crown. It refers to the common "wealth", or welfare, of the public and is derived from a loose translation of the Latin term res publica.

The American Heritage Dictionary of the English Language, Fourth Edition, 2000. 10. <u>https://www.bos-</u>

ton.com/news/politics/2020/09/29/massachusetts-question-1-right-to-repair-2020-ballotmeasure

Is Waymo's Driver-less Taxi Service Now for All?



Waymo has reportedly ordered 62,000 Chrysler Pacifica minivans for testing and eventual commercialization of its taxi service. Each of the Waymo vehicles, including all the equipment and software and remote personnel, costs around \$400,000. Is it worth it? Waymo seems to think so.

"Waymo is impressive, but a highly specialized solution. The Tesla approach is a general solution. The latest build is capable of zero intervention drives. Will release limited beta in a few weeks."

— Elon Musk (@elonmusk) October 8, 2020 <u>https://www.in-</u> <u>sidehook.com/daily brief/vehi-</u> <u>cles/waymo-driverless-taxis-phoe-</u> <u>nix</u> POLITICIANS AREN'T ALONE in making boastful claims that either omit important facts or bury the particulars inside purposely misleading statements. On the 8th of October 2020, with great fanfare, *Waymo* announced that it would start offering rides in its *Chrysler Pacifica* minivans with no attendant on board in the Phoenix, AZ suburb of Chandler, its 50-square mile (130 square kilometers) test area. That means there would be no human back-up driver sitting behind the steering wheel, ready to take control in the event that a disengagement of the driverless software was necessary. Here is exactly what *Waymo* said:

"We're excited to open up our fully driverless offering to Waymo One riders. Members of the public service can now take friends and family along on their rides and share their experience with the world. We'll start with those who are already a part of Waymo One and, over the next several weeks, welcome more people directly into the service through our app (available on Google Play and the App Store). In the near term, 100% of our rides will be fully driverless. We expect our new fully driverless service to be very popular, and we're thankful to our riders for their patience as we ramp up availability to serve demand."

To me, and to lots of other people who have been writing and talking about it, this sounds like Waymo has now made the big leap to fully driverless, at least within the Chandler operational design domain. Let's look more closely at this announcement. Waymo suspended its Chandler operations for most of its vans on the 17th of March due to the COVID-19 pandemic. Up until the 7th of April, *Waymo* continued to operate a limited number of vans without a back-up driver for "individuals who were part of the early access program within Waymo One ridesharing service." After the 7th of April and until the 11th of May there were no Waymo vans operating at all. On the 11th of May and until the 8th of October, the vans were out again on the streets but without any passengers. This was for health safety reasons, to keep the drivers from contracting the virus from passengers and to prevent drivers from infecting passengers.

Waymo goes on to say in its announcement that "for the next several weeks (after the 8th of October), every *Waymo* ride in the Phoenix area will be without a backup

driver." <u>There is nothing new here</u>. *Waymo* was already providing non-back-up driver rides to Waymo One customers before the pandemic. In recently released information, *Waymo* says that it has driven 65,000 driverless miles in its Phoenix area test site, and that about 5-10% of its operations have been 'rider-only services' (i.e., with no back-up driver). It states that it has provided a total of approximately 1,000 to 2,000 rides per week (with and without back-up driver). That means between 50 and 200 of those rides per week were without back-up drivers.

The news release continues to say that after the next several weeks, it will <u>re-introduce human backup drivers</u> behind the wheel in some of the vehicles so the company can work on expanding its service area. "Later this year, after we've finished adding in-vehicle barriers between the front row and the rear passenger cabin for in-vehicle hygiene and safety, we'll also be <u>re-intro-</u><u>ducing rides with a trained vehicle operator</u>, which will add capacity and allow us to serve a larger geographical area."

The moral of this story is read the fine print. The headlines all said one thing, but when you see what is behind those headlines, a different picture emerges. I don't believe that Waymo was trying to deceive. There are people who simply want to believe we are somewhere other than where we are, and they put their undying faith in companies whom they believe will take us there. It's human nature. Odd, isnt't it?

You are never really alone in a Waymo taxi

John Krafcik, *Waymo* CEO, said that *Waymo* has stepped up attention to sanitation of its vehicles in response to the pandemic. When there is no back-up driver on board, *Waymo* will monitor vans remotely, and employees will remind customers to keep masks on in the vehicles. Vehicles will be cleaned regularly under a maintenance and fleet management partnership with auto retailer AUTONATION INC.

"The cars are not totally alone in the wilderness," says a *Waymo* engineer who was interviewed by a journalist from *THE VERGE* who prepared a video of a driverless ride he took recently. "*Waymo* has a team of employees that watch a real-time feed from each of the vehicle's eight cameras and can help with the touch of a button if the software runs into a tricky spot and needs a human eye to figure it out. These folks don't joystick the car or anything like that, but they can help answer specific questions that a car might have about an ambiguous situation, and that's where human intuition and human understanding of the entire context is super important. For example, if there is a moving van in the lane

ahead, should the car go around it or wait for it to move. If the back is open, the ramp down and there is a person taking something off the ramp, the car is going to be there for a while. That's not something we've gotten around to, making the car smart enough to understand, but a human sees that in a moment and can make the judgment to go around it. The remote personnel can send that signal to the car."

Waymo delivers way more data, but is it useful data?

Hyperbolic stories about *Waymo* continued through October. In late October, the *Waymo* promotional printing press was busy again pumping out a report that journalists described as containing "a trove of new safety information".¹¹ Data in the report includes information on 47 collisions, both actual and simulated (see sidebar for an explanation of 'simulated' collisions) that *Waymo* compiled between January 2019 and September 2020.

On the 30th of October, *Waymo* published two papers that the company says explain "the processes we use to drive fully autonomously on public roads and validate the safety of our operations". The <u>first</u> is *Waymo's* **Safety Methodologies and Safety Readiness Determinations**. It includes the details of Waymo's Safety Framework. The <u>second</u> is *Waymo's* **Public Road Safety Performance Data**, which analyzes the miles its cars have driven on public roads in Arizona "to provide data about our operations in practice".¹² This is what *Waymo* says about its initiative:

"This is the first time an autonomous technology company has released a framework describing the safety of its fully autonomous commercial operations. We believe this transparency and accountability is important for demonstrating the trustworthiness of our operations, and critical to deepen the dialogue around autonomous driving safety."¹³

Waymo states that the paper includes every "collision and minor contact experienced during these operations as well as every 'predicted post-disengagement contact simulation' identified using the geek speak term 'counterfactual', which means "what has not happened but could, would, or might happen under differing conditions" according to the *Free Dictionary*.

I read a few of the journalist reviews and they were all congratulatory, thanking the company for setting a positive example for sharing their data. I decided I was going to have to read the *Performance Data* report myself to determine whether *Waymo* truly deserved the praise it was receiving. As it turned out, it took a couple of readings to find the answers to the questions that kept 11. Trove – a valuable collection, a treasure. (Merriam-Webster)

Waymo simulates collisions: The point of having a back-up driver or having remote monitoring of vehicles that are driverless is to prevent accidents. These so-called "disengagements" prevent accidents from occurring, but reduce the information that could potentially improve the driverless software. Waymo's safety framework provides detail on how Waymo has simulated the way an accident scenario would have played out if it had been allowed to continue. Included in the released data are 29 instances when an accident would have occurred if the disengagement of the driverless function had not occurred and the accident prevented.

12.

https://blog.waymo.com/2020/10/revealing-our-approach-tosafety.html?m=1 Safety Framework - <u>https://storage.googleapis.com/sdc-</u> prod/v1/safety-report/Waymo-Safety-Methodologies-and-Readiness-Determinations.pdf Performance Data - <u>https://storage.googleapis.com/sdc-</u> prod/v1/safety-report/Waymo-Public-Road-Safety-Performance-Data.pdf

13. Waymo suspended its Chandler operations for most of its vans on the 17th of March due to the COVID-19 pandemic. Up until the 7th of April, Waymo continued to operate a limited number of vans without a back-up driver for "individuals who were part of the early access program within Waymo One ride-sharing service." After the 7th of April and until the 11th of May there were no Waymo vans operating at all. On the 11th of May and until the 8th of October, the vans were out again on the streets but without any passengers.

arising as I read. The report is written and formatted like a research paper that would be peer reviewed, not like a promo piece, so I expected it to meet the requirements of such a paper.

There are five authors and the paper is divided into five sections and an abstract. It seems that each author was given a section since each one repeats much of what was in the other sections, especially the claim that "the fleet drove 6.1 million miles, which is the equivalent of 500 years of a single driver". They repeat the same claim, that "nearly all" of the events (collisions and near collisions) were caused by "one or more rule violation or other incautious behavior by another agent". 'Another agent' means someone in another car, on a bike or even a pedestrian. It seems a pedestrian ran into one of the Waymo vans! The term "human driver errors" appears throughout the document. While it does not clearly state what "nearly all" means, the paper makes the following claim: "While data related to these collisions modes is very promising, the presence of collisions that resulted from challenging situations induced by other drivers serves as a reminder of the limits of AV collision avoidance as long as AVs share roadways with human drivers." In other words, Waymo One never made a single mistake. Or nearly never. (Underlines are by the editor.)

The Methods section focuses mainly on describing the difference between events that actually occurred, that is, when someone or something hit a *Waymo* vehicle (because a Waymo vehicle never—or nearly never—hit anyone or anything, according to the authors), and when the safety driver took over from Waymo One and *Waymo* simulated what would have happened if the safety driver had not done so. Even in these 29 simulations, Waymo One never fails. It is always the other guy's fault. The only event that occurred when a vehicle was in driverless mode was on the 30th of September 2020, and that was a Waymo One being rear-ended while it was decelerating.

Only one out of 47 events occurred when the vehicles were in driverless mode (i.e., driving without a back-up driver). The reader has to intuit this because it is not clearly stated. You work backward from the fact that that 17 were actual events in which there was a back-up driver who did not disengage, and 29 were events in which there was a back-up driver who did not disengage. One is left. I guess my question to Waymo would be: If Waymo One is so good, why do you have back-up drivers at all? Why not just remove all of your back-up drivers and allow all of your cars to be driven in driverless mode? Then my question would be: How

do you disengage without a back-up driver in those rare occasions, those "not nearly all" times, when the driverless car does make an error? Is that when the remote controllers take over?

There were too many questions that were not answered in this paper. To start with, it did not provide the context data necessary to evaluate whether the claims it is making are credible or incredible. Here is my list of what the paper does not include:

- How many vehicles are in the total fleet and how many of them, on average, were on the streets within the test area at any particular time?
- When did the events occur? Was it during the morning or evening rush hour, in the middle of the day, in the evening, in the middle of the night? Was it raining, foggy, snowy (sorry, it doesn't snow in Phoenix)?
- What is the topography and road pattern of the test area? Is it hilly or flat, is the road pattern a grid of equal squares or rectangles (short streets mean more stops, like on New York City streets vs. avenues), are the roads straight or curved, is there on-street parking? Are there sidewalks and curbs, midstreet pedestrian crossings, signaled pedestrian crossings?¹⁴
- Are the roads divided by physical barriers? Are there one-way streets? Are there bicycle paths along the roadways or are they separated or are there no bicycle paths?
- Are all intersections signed or signaled, is turning right on red permitted, are there left-turn signals?
- What is the land use mix? Is it mostly residential or is there mixed uses along the same street like in Phoenix proper that has no zoning?
- Was any of the driving in parking lots or roads that are not part of the public road network, like access roads to office parks?
- How old are the safety drivers? How long have they been driving?
- Is there any control of the vehicles from a remote location? What actually happened when the driverless vehicle was hit? Was there anyone else in the car at the time? Did emergency vehicles have to come to the scene to remove the vehicle?

What I would have liked to see is a simple table with the incidents along the left side organized in chronological order with the date. For each incident I would like to know if it was while the car was in driverless or in self-driving mode (i.e., with a safety driver). Did the driver disengage before the incident or not? If not, what happened? If yes, what was the reason for the disengagement? List

14. In 1974 I went to Phoenix on business. I decided to walk from my hotel to the office, which was about two miles away. On my way back from the office to the hotel at around 8 p.m. when it was just getting dark, I was stopped by the police. They asked me what I was doing, dressed in a suit, carrying a briefcase and walking along the edge of the road since there were no sidewalks. I told them I was walking back to my hotel. They asked me if I would accept a ride from them since walking was dangerous in Phoenix.True story.

time of day, weather conditions, location (at intersection, in middle of street, in parking lot). What was the maneuver being made? How fast was the car moving? The table that has been provided seems to be intended to compare the number of *Waymo* incidents with a national average for similar incidents, rather than providing information about the actual event. The post-disengagement simulations are of limited or no use. They might be included in a separate section, but mixing them with the actual data is a distraction.

Two claims that really do not belong in the paper are that there were no rollovers or that cars did not leave the roadway. The authors state clearly that the speed limit in the test area does not exceed 45 mph. Rolling a car, even a van, at 45 mph or less is next to impossible unless you are on a steep downward slope and you make a sudden turn of the steering wheel. Anyone who has driven a car knows that. Second, cars leave the roadway on highways and rural roads when they skid on ice or on wet roads covered in leaves, or when drivers fall asleep or suffer a heart attack.

I agree that *Waymo* should be given credit, as they ask to be at the opening and closing of their paper, for publishing their data. The data is useful for seeing the traces of the *Waymo* cars and moments when they encounter other cars, cyclists and pedestrians. However, the fact that the main message of the paper, made repeatedly, is that Waymo One is perfect and (nearly all) humans are lousy drivers does not lend an air of objectivity to the writing. I would expect to read about how good a product is in a company's product literature, but not in a paper that looks like it is meant to be a serious research paper for peer review. Before it was released to the public it would have benefitted from a thorough edit to remove the repetition and purple prose.

Waymo has confirmed that a car produced by a reputable car maker, FCA, equipped with several hundred thousand dollars' worth of additional equipment, software and remote oversight can be made to travel at low speeds in its lane without wavering into parked cars or crossing the median into oncoming traffic, that it can stop at stop signs and traffic lights, follow the rules of the road and stop when someone or something crosses its path when it has the right-of-way. This is a good second step; the first was leaving the lab and venturing out into traffic. Other companies would do well to follow *Waymo*'s careful path.

Musings of a Dispatcher: Cars are from Mars



Natalie Wood as Judy and James Dean as Jim Stark in the 1955 movie REBEL WITHOUT A CAUSE. This scene is just before the 'Chickie Run' that pitted Jim against Buzz. The two race stolen cars toward a cliff and the first to jump out is the Chickie. Buzz gets tangled in the door latch and is unable to exit. He wins the Chickie Run and plunges to his death over the cliff.



Total number of licensed drivers in the United States in 2018, by gender

15. Department for Transport (2019, National Travel Survey Car travel factsheet: 2018, table NTS0201.

Will driverless riders be only from Venus?

SEEING A WOMAN behind the wheel of a hot rod racing James Dean in *Rebel Without a Cause* would be like seeing Dolly Parton tied up in a chair while three men sing *Nine till Five*. Cognitive Dissonance. Men invented cars. Men started and ran the companies that built the cars, not just in the United States but everywhere. To this day, the CEOs of car companies from Detroit to Nagoya—with the exception of GM's Mary Barra—are all male. The classic car collectors, like Jay Leno and Jerry Seinfeld, are men. It's a rarity to see a female car mechanic or a woman working in a tire garage. Take a look across the self-driving or electric car landscape and you will be hard pressed to find a single female at the management level who is not the HR chief. Aicha Evans is an exception. She was brought in by Zoox from INTEL.

For a long while, it was mostly men who bought and drove the cars that men built. In 1970, 76% of the drivers on U.S. roads were men. That was at a time when men comprised 48.7% of the total U.S. population. Nevertheless, the fact that the automobile industry has been male-dominated at all levels has not prevented women from buying and using its products. Today in the U.S., men make up 59% of the drivers on the road while they now are 48.8% of the population. In spite of the fact that men still drive more than women, since the 1960s the average distance driven has increased 33% for men, but it has gone up 89% for women.

In 2012, the number of women having driver's licenses in the U.S. exceeded the number of men for the first time. In 2018, of the total having a driver's license, 50.6% were women and 49.4% were men, as shown in the graph to the left. The situation is different in the UK where males are 49.1% of the population and females 50.9%, and 81% of men and 70% of women have driver's licenses. Men drive twice as many miles per year than women.¹⁵ In some countries, 0% of the women have driver's licenses.

Disregarding the exception countries, more and more women are buying and <u>driving</u> cars. Maybe they're not buying *Corvettes* or *Ferraris* (only 18% of *Ferrari* buyers

are women, but it's not zero), but not a lot of men buy super cars either.

So, I've been musing: If the principal outcome of having driverless cars is that people don't drive them but ride in them, and if we begin to introduce driverless cars on the roads at some point in the future—for real, not for tests where who gets to ride can be controlled— who will ride in them? Will it be more men or more women or about the same number of each sex in proportion to the population? Will it matter where the cars are introduced, in cities or suburbs or rural areas? Will there be differences by income and age as well as sex? Will there be differences by country, more men in one country and more women in another? Will the riders move over from buses or trains to the driverless cars, or will they come from the cars that don't need to be driven anymore?

Will 'the powers that be' try to move men out of cars first because they are the ones who are dying and are being injured at much higher rates than women?¹⁶ Or will those powers decide to concentrate on protecting women by giving them the pride of place in the safer driverless cars and let the men stay behind the wheels and fend for themselves? Will they be reserved for people who do not have a car, cannot afford a taxi and have a need to travel to and from places that are not adequately served by buses or trams, or will rides be sold on a first come, first served basis at market prices?

You might wonder why I think these questions matter. Well, until around 2002, I didn't believe it made any difference who was driving or riding in a car or who was designing, building or fixing them. You might say that I was a clueless and insensitive male chauvinist. There might be chairs and beds and dinnerware for children, I thought, but when it came to teenagers and adults, normal cars (i.e., not super cars) were made to be driven and ridden in by everyone, regardless of sex, race, religion or level of education. My wife is a better driver than most men I know. I have a good friend who converted from Catholicism to Lutheranism and I have not noticed any difference in his driving abilities. My grandfather was illiterate and he drove better than many of my friends with PhDs (no offense guys and girls).

Then, in 2002, our local newspaper, *Götebors-Posten*, began writing about a concept car that was going to be designed "by women for women". The result, **Your Concept Car (YCC)**, was presented

16. Men account for 73% of all worldwide road traffic deaths, three times the rate of women, according to the World Health Organization.

(https://www.who.int/newsroom/fact-sheets/detail/road-traffic-injuries)

In Britain men account for 74% road traffic deaths, 69% of serious injuries and 57% of slight injuries on the roads.

at the 2004 *GENEVA INTERNATIONAL MOTOR SHOW*. The car was conceived, according to Volvo, with the view to "targeting the most demanding premium customer, the independent professional woman".

When Hans-Olov Olsson, who was President and CEO of VOLVO CAR CORPORATION at the time, was presented with the idea in 2002 by Camilla Palmertz, one of the two project managers for the *YCC*, he was quoted as saying: "This is a fantastic opportunity for us: we can concentrate on the fast-growing group of women customers—without losing the men. Because I'm certain that our male customers will love this concept car." Interesting, I recall thinking. If the men would love it, why did it need to be designed by women? Why hadn't all the nifty stuff the women would come up with already been included in the designs? But the devil is in the details, as the saying goes, so let's look at what the female team came up with.

The all-female team started by saying that their car would naturally include the three things that men want in a car, which they said were performance, prestige and style. I'm not sure why they didn't include my demographic in their 'men' category, but I want price-performance, safe operation in all weather conditions (especially snow and ice), high fuel economy, dependability, comfortable seats, high visibility, ample storage and good design. I actually think that most men and women want these things as well, except for those who buy only one car and it's a KOENIGSEGG. Here's what the all-female design team claimed that women want in addition to everything that men want in their cars, and what their design included to satisfy those demands:

- Smart storage make all of the central console storage space and convert the space behind the front seat for bags
- A car that is easy to get in and out of gullwing doors and dropdown sill
- Good visibility "The bonnet section has been lowered and the fenders have been deliberately brought into sight. Add to this the fact that the rear window extends right to the extremities of the car and the driver will know exactly where the four corners of the car are," says Anna Ros'n, the designer of the YCC exterior.
- More choice and flexibility easy-to-remove seat covers allow different interior trim when the spirit moves you
- Minimal maintenance "The only time I ever open my bonnet is when I need to fill up with windscreen washer fluid," says Tatiana Butovitsch Temm, YCC Communications Manager. "So we asked ourselves whether you should have to open the bonnet just to do



Here's the all-female YCC team standing in front of their gullwing creation. Why are they all in black? Below is an unhindered view of the car with its wings up.



Show the SCC (Safety Concept Car) in 2001, etc.

that. We realised that it could just as easily be done from the side of the car." (See sidebar)

- Easy to park automated parking system
- Low emissions -start/stop engine

The platform for the car was the *Volvo Safety Concept Car (SCC*) developed in 2001 (by men and women), which eventually was commercialized as the C30 in 2006 and sold until 2013. YCC was definitely not a car for school runs and chauffeuring kids to sports activities. It was not for weekend excursions to IKEA or seasonal vacations in the mountains. It was designed to take independent professional women to their work and back. There was nothing in the documentation for the *YCC* project indicating that women didn't like to drive, so there was no mention of the car being driverless, one in which the female occupant would be a passive passenger. This entire project was about independent professional women being in control, not about being chauffeured.

Today, in the U.S., VOLVO says that more women buy their cars than men, and the women are probably using them for the same things that men use them for.¹⁷ VOLVO has a few models that are among the twenty-five cars that are purchased by women in higher numbers than men. Having to drive cars does not seem to be putting women off buying them, and their appetite for purchasing cars does not appear to be sated.

Looking for riders in all the wrong places

TESLA says it has thousands of self-driving cars on the road already and that if you ignore their recommendation to keep your hands on the steering wheel, it can be driverless. Who owns their cars, and did they buy them for their driverless functionality? TESLA Model S and Model X owners are just under 54, 66% don't have children at home, 87% are White, have an average annual income of around \$150,000, 88% own their own home with a media value of \$348,167, and most of them live in California. Males comprise 71% of Model X owners and 77% of Model S owners. Model 3 owners have a median age of 46, 84% are male, only 56% own their own home, and the majority of them also live in California.

Do these mostly male TESLA owners buy the car for its driverless potential? Are they the men from Mars who will be the early adopters of driverless cars and driverless services, and not the women from Venus? TESLA has delivered just over a million vehicles during its lifetime. Of those, only 50,000 do not have any Autopilot hardware, 115,000 have the minimal functionality Autopilot 1 hardware and the remainder have Autopilot 2 or 3. Of the



It goes without saying that you need to make sure you get the correct nozzle in into the right hole.

17. <u>https://www.thecarconnec-</u> tion.com/news/1086357_studyfinds-that-men-are-from-lincolnwomen-are-from-volvo Autopilot-equipped cars, 30-40% have paid \$6,000-€7,000 for the privilege of using the function, and their use is approximately 3-4% of the time that the cars are being driven.^{18,19} Maybe these TESLA buyers would purchase an *Omega Constellation* watch for \$6,500 and wear it only at the New Year's Eve party and have a *Casio Quartz* on the rest of the time. We don't know how many of the 40% actual users are women who perhaps use the feature at a much higher rate than men. Maybe they would be the *Omega* buyer who wore her watch every day. I need to keep searching.

In February 2017, I gave a talk at a gathering of navigable map experts at the ERTICO offices in Brussels. I don't think the people who asked me to speak expected what they received: <u>When Robots Drive</u>: <u>Will it truly be the end of death and delays on our</u> <u>roads?</u> My answer was 'No'. The talk was received with about the same amount of enthusiasm as my presentation to a group of road toll promoters in 2010 on why road tolls are a bad idea. The one woman who was in the Brussels conference room was the most indignant. She said: "I don't understand why you are so critical. I can't wait for driverless cars because I don't like to drive. I have better things to do with my time." I appreciated her honesty. She seemed to be independent, and she was definitely a professional. Maybe she was not part of the demographic that was considered by the VOLVO *YCC* team, an independent professional woman who didn't like to drive.

At least some others in the room, who were all men, probably agreed with her but they didn't admit to having the same opinion. What would the other men think of a man who was working for a car company or a company that sold products or services to car companies if he said he didn't like to drive? Real men don't ride shotgun to a woman, right? I think more men have been coming out lately, encouraged by people like Elon Musk to show their more vulnerable side, and admitting that they could think about falling asleep in the back seat while their car drove itself. Some have already tried it. Real men can ride, too, even if they're alone in their car, even if their spouse or girlfriend or a female taxi driver is driving. As I thought about this experience, I felt like I was getting closer to an answer of who would be the driverless riders.

I found a number of user stories provided by *Waymo*, testimonials on why the people who are using their service particularly like the fact that their taxis do not have a safety driver (i.e., are driverless). There are plenty of statements about why someone takes a taxi rather than driving their own cars or taking public transport, but <u>https://lexfridman.com/tesla-</u> <u>autopilot-miles-and-vehicles/</u>
19.

https://www.forbes.com/sites/joh nkoetsier/2019/12/18/30-40-oftesla-owners-buy-autopilot-andfull-self-driving-is-just-3-yearsaway/ this is not a justification for a completely driverless taxi service. Finally, I found some testimonials by women. Lilla says: "Self-driving cars are the future that I want. I personally don't like driving; it gives me anxiety though I'm a very cautious and courteous driver. Waymo eliminates the stress of getting behind the wheel, and I feel safer in a car that's designed to never get distracted or tired." Jean says: "I appreciate the predictability of Waymo One, especially if I'm using it alone. I always know what vehicle to look for; I don't recognize car makes and models very well, so it's helpful that all Waymo cars are the same. I know exactly where it will pick me up and that it knows the route and won't stare at its phone instead of the road throughout the ride. Lastly, if it picks me up at home, I don't have to worry that it knows where I live and that I won't be home for a few hours. More broadly, it would certainly be a whole lot safer to have more self-driving cars and fewer unpredictable human drivers."

I definitely believe we are on to something here. Neither my sister nor my mother ever had a driver's license. They took the bus when they needed to go downtown. My father and then my brother-inlaw were their chauffeurs on all other trips. My sister is now a widow and avoids taking taxis like her life depends on it. It is not because she cannot afford to take taxis or that that the taxi services in Scranton, Pennsylvania where she lives are undependable. She says she simply does not like being driven by strangers. My mother said the same thing. If one looks at the reports on the problems female riders have with taxi services, especially those in which the drivers are independent operators as with Uber and Lyft, I think we can understand that a car without a driver, especially a male driver, has a definite allure to female riders, those who don't want to drive, do not want to own their own car and aren't that interested in biking, taking buses, trams or trains.

If I were running a company developing a driverless car, I would set up teams to design the vehicle that would transport the principal group of riders, one for women and one for men, like the VOLVO CAR CORPORA-TION'S *Your Concept Car* project did almost two decades ago for women. The male team should include adult males with driver's licenses and years of actual driving experience, not geek programmers. The female team should include drivers and non-drivers. Maybe the result would end up looking like a *Chrysler Pacifica* or the old *Fiat 500* look-alike that Google rolled out and then rolled back at the start of its driverless car adventure. But at least we would start to put the focus on who would be inside those vehicles. Robots don't ride, people do.



Mars or Male or Iron or Volvo



Venus or Woman or Copper



Volvo Your Concept Car

About Michael L. Sena

Michael Sena, through his writing, speaking and client work, attempts to bring clarity to an often opaque world of vehicle telematics. He has not just studied the technologies and analyzed the services, he has developed and implemented them. He has shaped visions and followed through to delivering them. What drives him—why he does what he does—is his desire to move the industry forward: to see accident statistics fall because of safety improvements related to advanced driver assistance systems; to see congestion on all roads reduced because of better traffic information and improved route selection; to see global emissions from transport eliminated because of designing the most fuel efficient vehicles.

This newsletter touches on the principal themes of the industry, highlighting what, how and why developments are occurring so that you can develop your own strategies for the future.



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