Volume - Issue
08-11
October 2021

Telematics Industry
Insights by
Michael L. Sena

THE DISPATCHER

IN THIS ISSUE

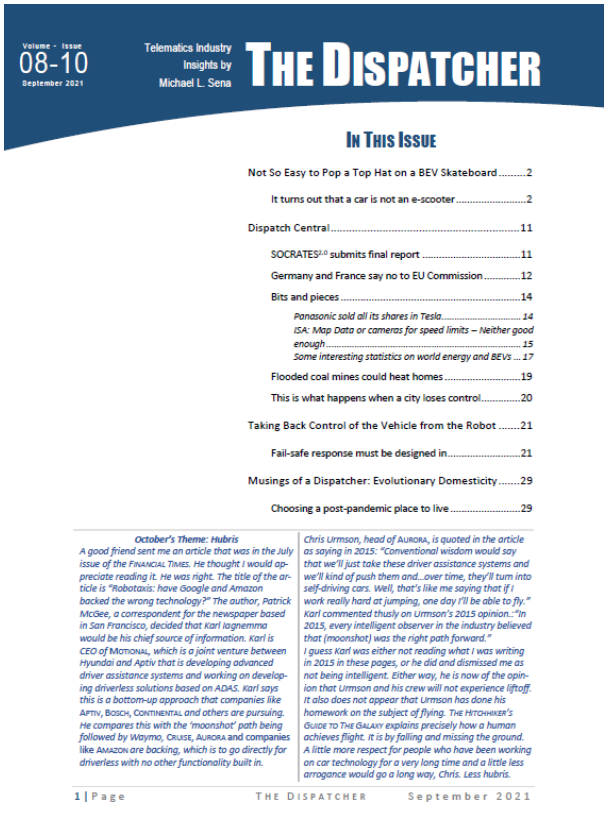
The Issue's Theme: What's a Car Company

The lead article and Musings are principally about what it now means to be a car company. Once the automobile invention period passed, after Henry Ford, David Buick, Walter Chrysler, the Peugeot brothers and all the others established the basic model for a car business, everything moved like a well-oiled machine. There was a periodic breakout, like the DeLorean, named for its founder, John DeLorean, but makers, buyers and sellers knew what to expect from each other and everybody did their job to keep those machines' wheels turning.

TESLA was the first to challenge the basic model on all counts, not just by assembling a car from parts provided by suppliers, but on how the car was to be sold, delivered, fueled (charged), and maintained. Few took TESLA seriously until its second car, the Model S, hit the pavement. Then it seemed like the ground beneath the car business foundations began to shift and then shake.

Automotive journalist Beverly Rae Kimes (1939-2008) says in her book, The Standard Catalog of American Automobiles, that there were 2,800 automobile companies in the U.S. prior to 1930. In 1930, there were fifty left. We are now in the midst of an upswing in the number, and this time it is not car mechanics, machinists and designers, but a diverse group of individuals and organizations that see the car as any other appliance that can be delivered in a box left at the door or offered as a subscription service. Changes have just begun.

August/September Issue of The Dispatcher



Volume - Issue 08-10 September 2021

Telematics Industry Insights by Michael L. Sena

THE DISPATCHER

IN THIS ISSUE

October's Theme: Hubris

A good friend sent me an article that was in the July issue of the FINANCIAL TIMES. He thought I would appreciate reading it. He was right. The title of the article is "Robotaxis: have Google and Amazon backed the wrong technology?" The author, Patrick McGee, a correspondent for the newspaper based in San Francisco, decided that Karl Iagnemma would be his chief source of information. Karl is CEO of MOTIONAL, which is a joint venture between Hyundai and Aptiv that is developing advanced driver assistance systems and working on developing driverless solutions based on ADAS. Karl says this is a bottom-up approach that companies like APTIV, BOSCH, CONTINENTAL and others are pursuing. He compares this with the 'moonshot' path being followed by Waymo, CRUISE, AURORA and companies like AMAZON are backing, which is to go directly for driverless with no other functionality built in.

Chris Urmson, head of AURORA, is quoted in the article as saying in 2015: "Conventional wisdom would say that we'll just take these driver assistance systems and we'll kind of push them and…over time, they'll turn into self-driving cars. Well, that's like me saying that if I work really hard at jumping, one day I'll be able to fly." Karl commented thusly on Urmson's 2015 opinion.:"In 2015, every intelligent observer in the industry believed that (moonshot) was the right path forward."

I guess Karl was either not reading what I was writing in 2015 in these pages, or he did and dismissed me as not being intelligent. Either way, he is now of the opinion that Urmson and his crew will not experience liftoff. It also does not appear that Urmson has done his homework on the subject of flying. THE HITCHHIKER'S GUIDE TO THE GALAXY explains precisely how a human achieves flight. It is by falling and missing the ground. A little more respect for people who have been working on car technology for a very long time and a little less arrogance would go a long way, Chris. Less hubris.

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THE DISPATCHER

Telematics Industry Insights by Michael L. Sena
October 2021 – Volume 8, Issue 11

There Is a New Order Emerging for the Auto Industry

What happens when suppliers can do it all

IN THE MIDDLE of July, financial news channels were buzzing with the announced bid by MAGNA INTERNATIONAL INC. for VEONEER INC. VEONEER is a 2018 spin-off by Swedish automobile safety systems supplier AUTOLIV of its electronics and automated driving divisions. VEONEER develops products that include radar, lidar, thermal night vision cameras, vision systems, advanced driver assistance and automated driving software. It is a supplier to many of the global vehicle manufacturers. In 2020 it had net sales of $1.4 billion and a net loss of $540 million.

MAGNA INTERNATIONAL INC. describes itself as "a mobility technology company". It was founded as MULTIMATIC INVESTMENTS LTD. in 1956 by Frank Stronach in Toronto and has its headquarters in Aurora, Ontario, Canada. It has over 157,000 employees, 344 manufacturing operations and 93 product development, engineering and sales centres in 27 countries. It has complete vehicle engineering and contract manufacturing expertise, as well as product capabilities that include body, chassis, exteriors, seating, powertrain, active driver assistance, electronics, mechatronics, mirrors, lighting and roof systems. MAGNA INTERNATIONAL Inc. is ranked No. 4 on the 2020 *AUTOMOTIVE NEWS* list of the top 100 global suppliers, with worldwide sales of $32.65 billion in 2020. This was a drop down from a third position in 2019 when it had $39.43 billion in sales.

On the 5th of August, VEONEER received a bid from QUALCOMM which, at $4.6 billion, was 18% higher than MAGNA's. Both VEONEER's and MAGNA's boards had unanimously approved the MAGNA offer, so if VEONEER decides to accept MAGNA's there will be a $110 million breakup fee due from VEONEER to MAGNA. It is unlikely that MAGNA would increase its bid since there was some board resistance to the acquisition. QUALCOMM currently has a cooperation agreement with VEONEER around VEONEER's *Arriver* software stack for

ADAS and semi-autonomous driving. VEONEER's System on a Chip (SoC) hardware platform for *Arriver* will use the QUALCOMM *Snapdragon Ride* platform.

Why is QUALCOMM making this bid? It is a smartphone chip company. Automotive products accounted for only around 3% of chip sales in 2020. However, its main rivals, INTEL and NVIDIA, are aggressively pursuing automotive business. QUALCOMM's CEO, Cristiano Amon, wrote in a letter that his company's interest in VEONEER is driven by *Arriver*, and that if its bid is successful it will divest of the other parts of the VEONEER business "to parties who are better positioned to grow these strong and stable businesses," but that divestiture is not a precondition of its proposal to acquire VEONEER.

What was it about the MAGNA/VEONEER news that sparked my interest? I wrote to several friends the day I read about it saying that *"Magna International's bid to acquire Veoneer is, in my opinion, one of the major pieces of automotive news in quite some time*". I was in the middle of writing my lead article for the September issue of *THE DISPATCHER* about why battery electric vehicle skateboard delivery as a business is not what it was cracked up to be, and this announcement reminded me that I have suggested companies like MAGNA could potentially be competing with, not just supplying to, automotive OEMs.[1] In the July issue I had explored the topic of what it will take to deliver driverless capability for everywhere, rather than just somewhere, and concluded that the bottom-up, advanced driver assistance systems-to-driverless was a more promising route than the top-down, AI approach. And now, one of the largest automotive suppliers, the one with full manufacturing capability, was acquiring a company with outstanding ADAS systems. *"It's putting the final pieces together,"* I thought. The QUALCOMM bid reinforced my thinking. Either MAGNA will pick up what QUALCOMM divests or it will find those pieces somewhere else.

1. See the October 2020 issue of The Dispatcher, *Dealers are the Present and Future of Automobility.*

Unravelling a weave starts by untying a knot

We need to put what is happening with MAGNA, VEONEER and other companies in and around the automotive industry into context. Social, economic, political and technological changes have occurred during the past twenty years which have dramatically changed that context. Looking at the automotive industry today, we see many loose threads. It wasn't that way twenty years ago at the turn of the millennium. That was when the car companies were firmly in charge of their entire value chains. Car companies

Diego Rivera, Detroit Industry murals, 1932-33, twenty-seven fresco panels at the Detroit Institute of Arts. Rivera depicted the golden age of the American car industry.

assembled cars which they designed from parts they made themselves or sourced from tier one suppliers. They sold the cars in dealerships which were franchised independents or owned through national sales companies. Warranties were extended to attract customers to dealership workshops, and parts, services and accessories formed a large portion of a car company's profits. Few new companies entered the mainstream of car manufacturers, and those that had survived the culling in the 50s and 60s were either acquiring or being acquired by other car companies. Used car dealerships and independent repair workshops had a symbiotic relationship with the car manufacturers, even though at times those relationships were strained.

The Driverless Thread

It had taken one hundred years to weave the tapestry that was an image of the automotive industry. What happened to cause that tapestry to fray at the edges and then to become a pile of loose threads? It started before terrorists flew hijacked planes into the World Trade Center Twin Towers and the Pentagon, but that event accelerated a nascent activity: vehicles that would drive themselves. The DARPA Grand Challenge in 2004 was not staged for the benefit of the automobile industry. The U.S. military wanted a way of projecting mobile force into hostile environments without putting military personnel in harm's way. DARPA created the 'autonomous car' thread by offering a monetary prize to contestants who developed vehicles that could steer themselves. Today, the children of the DARPA kindergarten have graduated to Waymo, CRUISE and AURORA, and TESLA drivers believe they can fall asleep at the wheel when TESLA's Autopilot is engaged. Investors are throwing bags of money at them all.

The China BEV Thread

Then there is China. It was admitted to the WORLD TRADE ORGANIZATION in 2001. In less than ten years it became the world's largest car market. In order to sell their cars in China and take advantage of the extraordinary growth, Western car companies were forced into joint ventures in which they had minority shares. That resulted in technology and business knowledge transfers that now give the Chinese companies the possibility to compete with their own cars in Western markets, like the MG from SAIC, Lynk & Co from GEELY, VOLVO's Chinese-built Polestar and Han from BYD. What these models share is the focus on electrification, which is the second major thread. China recognized that electrification was their ticket into the West, and they stealthily built up the battery electric vehicle ecosystem, from cobalt mines to battery production. Its CONTEMPORARY AMPEREX TECHNOLOGY is the

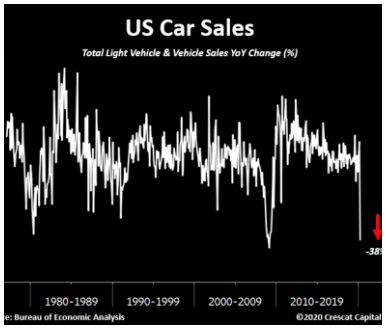
world's largest battery manufacturer. Besides GEELY, BYD and SAIC, China has a slew of start-up BEV companies that investors are throwing even more money at than the driverless companies.

The Anti-diesel Thread

Dieselgate certainly helped to move the BEVification of the car industry along. VW, BMW, MERCEDES-BENZ, PSA and even VOLVO CARS had all committed themselves to developing fuel-efficient and more environmentally sustainable diesel cars. Then, in 2015, VW was found to be cheating on their claims by turning on the emission controls when the car was being tested and turning them off when it was being operated. *Mea culpas*, heavy fines and prison sentences pushed the companies out of diesels and into the world of BEVs.

The Depression Thread

Two catastrophical events, the Great Recession in 2009 and the COVID-19 pandemic in 2020, solidified China's dominant position in the automotive industry. In 2009, GM and Chrysler declared bankruptcy and car sales plummeted in the U.S. and Europe. Car sales in China actually grew by over 50% in 2009 and dropped by only 9% in 2019 and 4% in 2020, while in the U.S. the drop was 38% for 2019 and 2020 combined. This caused the Western car companies to be even more dependent on China as the market where they needed to sell cars to remain in business. It wasn't just automobiles where this transfer of power was occurring. China not only became the Factory for the World (in its own words); it became the market for the world.



The Internet Disruption Thread

One of the most insidious causes of the automotive tapestry fraying is the Internet. It is responsible for many of the frayed threads. Smartphones, the principal child of the Internet, have completely changed the relationship car owners, drivers and passengers have with vehicles and the companies that sell them. While car companies have tried to control the in-vehicle experience by attempting to design the interface between the car's occupants and the suppliers of both the smartphone operating systems and the providers of their apps, Google and APPLE are slowly winning that battle. TESLA was first to sell it cars directly to customers via the Internet, but most companies—especially the new entries from China that have difficulty convincing established dealerships to carry their products—are going direct to customers as well.

The Decoupling Thread

Another independent thread is enabled by a combination of the Internet, mobile communications and the conversion of vehicles from mechanical to digital devices. Drive-by-wire substitutes

software for hardware, and software does not need wrenches and grease guns to be maintained. Vehicle sofware as well as firmware[2] can be updated in the same way our computer and mobile device operating systems and software can be updated: over-the-air. TESLA was about to lose a star in the NCAP evaluation because the braking distance on its new Model 3 was too long. *Abrakadabra*, the brake software is updated in a flash and a star is added. Just like that. When cars are not brought back to dealer workshops or even independent workshops, a link in the value chain of building and selling cars is broken. It doesn't even have to be the seller of the car that is doing the updating; it can be a group in India, Estonia or anywhere delivering remote services using another thread unraveler, cloud services provided by AMAZON, MICROSOFT or Google.

2. Firmware is software that's embedded in a piece of hardware. Think of firmware as "software for hardware." However, it's not an interchangeable term for software.

The Cloud Thread

The Outsourcing Thread

Outsourcing of software development and maintenance has become commonplace, but so has outsourcing of manufacturing. Anyone can go into the watch-, shoe-, eyeglass-, beer-, car- or anything-making business. Produce a few pages of specifications, send them to a fabrication shop in China or Taiwan and start selling. The fabricator's logistics arm does the rest. APPLE has done more for perfecting this model than any other company. APPLE had its own manufacturing facilities at the start, and built one in 1984 specifically to build the Macintosh. It closed the facility two years later and its co-founder, Steve Jobs, left the company in 1985. Apple spent a dozen years wandering in the desert until Jobs returned in 1997. In 2000, APPLE and FOXCONN (HON HAI PRECISION INDUSTRY) formed a partnership that helped to make both companies what they are today, very successful, and has changed the manufacturing paradigm for all companies.

Semiconductor manufacturing is an excellent example of where outsourcing can lead. Like vehicle OEMs, electronics manufacturers depended on tier one suppliers for critical components that require a high degree of innovation, fast development cycles and a high degree of dependability. INTEL, QUALCOMM, TEXAS INSTRUMENTS and others satisfied these needs. But then, companies like APPLE began to believe they could do a better job of designing their own chips that would provide them with competitive advantages compared to taking off-the-shelf chips from INTEL and the others. It turned to another Taiwanese company, TAIWAN SEMICONDUCTOR MANUFACTURING CO (TSMC), a so-called 'foundry'.[3] It is also a supplier to QUALCOMM, which

3. Foundry – an establishment where founding is carried on; a building or factory where metals are produced; an establishment where metal objects are made by melting and pouring it into molds.

outsources the production of its own in-house-designed chips. TSMC accounted for 54% of total foundry revenue globally in 2020.

Unfortunately for the companies that eventually put those chips into their products, like automobile manufactuers, they had to turn off the delivery of chips when their sales collapsed during the pandemic, but when consumers began buying cars again, their chip suppliers and the foundries who made the chips, like TSMC, could not meet the demand. As a result, assembly lines are idle, cars cannot be built, and unbuilt cars mean undelivered cars.

Insourcing sounded like a good idea ten years ago

Ten years ago, an article appeared in the *HARVARD BUSINESS REVIEW* warning companies not to outsource too much of their businesses to tier one suppliers.[4] Here is a quote from the article:

"In the past 25 years, major original-equipment manufacturers around the world have shifted to the Japanese tiered approach to supply chains. They've radically reduced the number of suppliers that they directly manage and off-loaded responsibility for supervising the rest, along with the task of building major subsystems, to a handful of first-tier suppliers. The attractions for OEMs were faster new-product introductions, larger volume discounts, reductions in the capital and risks associated with developing and producing the subsystems, and the ability to spend less management time on overseeing the multitude of lower-tier suppliers and more on building core competencies.
But we believe that the delegation has gone too far. Our conclusion is based on studies of the practices at some 20 leading multinational corporations. We discovered that a heavy reliance on first-tier suppliers is dangerous for OEMs. It weakens their control over costs, reduces their ability to stay on top of technology developments and shifts in demand, and makes it difficult to ensure that their suppliers are operating in a socially and environmentally sustainable fashion. The remedy is for OEMs to forge direct relationships with a select number of lower-tier suppliers."

I remember reading the article at the time and thinking it was about time the business academics changed their tune after years of telling companies to focus on their 'core competencies' without understanding what constituted 'core'. At least a few of the automotive OEMs had learned the lesson. BMW, MERCEDES-BENZ, VW and VOLVO CARS had begun to rebuild their R&D teams and

4. Choi, Thomas Y., Linton, Tony. Don't Let Your Supply Chain Control Your Business. Harvard Business Review (December 2011).

https://hbr.org/2011/12/dont-let-your-supply-chain-control-your-business

create their own software development teams. Direct relationships with tier twos and threes, which was suggested in the article, sounded like a good idea at the time. APPLE contracting with TSMC for their semiconductors rather than turning over that relationship to FOXCONN looked good on paper. It meant one less company adding their margin to a supplier's fee and more control over the resulting component. Car companies signing the deals with mobile app providers rather than letting their tier one infotainment system suppliers do so was also in line with the recommendations from Professor Choi and MCKINSEY consultant Linton. It is just that when taken together with all of the other changes that were taking place in the automotive industry, the result was simply one more loose thread among many other loose threads. In the same way that APPLE could contract with TSMC rather than buying chips from INTEL and manufacturing their own iPhones rather than contracting with FOXCONN, so could iPhone copycats and NVIDIA and QUALCOMM become more competitive with INTEL. Instead of gaining more control, the OEMs helped to foster new suppliers that could be used by both direct and indirect competitors to create products that competed with their own.

The foundry model will pull the last thread

Manufacturing and final assembly of cars by the OEMs has remained almost intact so far—or, better said, it has been the car manufacturers' little secret that they outsourced some of it. Car manufacturers only reluctantly outsourced manufacturing once they moved from body-on-frame to unibody construction. They turned to specialty manufacturers when they needed to produce a short-run vehicle or for making a part of a car that was not used on the majority of their models, such as a convertible top or sunroof. MAGNA STEYR AG & CO KG, which is a wholly-owned subsidiary of MAGNA INTERNATIONAL, is one of a handful of contract passenger car manufacturers working mostly for European OEMs. Others include VDL NEDCAR in The Netherlands and VALMET AUTOMOTIVE in Uusikaupunki, Finland.

VDL Nedcar

VDL NEDCAR is an automotive manufacturing company in Born, The Netherlands. It was founded in 1967 by the former VAN DOORNE'S AUTOMOBIEL FABRIEK (DAF). In 1975, AB VOLVO acquired it and renamed it VOLVO CAR B.V., a name it retained until 1992. This is where the Volvo 300 Series was developed and manufactured from 1976 until 1991.[5] It was about to close when the Dutch State came in with financing and formed a JV with AB VOLVO and

5. A 1981 Volvo 343 GL similar to the one I drove during the periods I was in Sweden between 1982 and 1984. It lived up to its nickname, *minipansarvagn (*small tank*).*

Mitsubishi Motors which began in August 1991. On 15 February 1999 the Dutch government sold its shares to its two partners, which then owned 50% each. Two years later, Volvo sold its shares to Mitsubishi. The last Volvo automobiles were built in 2004, and the last Mitsubishis in 2012. Since December 2012 it has been owned by the Dutch industrial conglomerate VDL Groep and renamed to VDL Nedcar.

VDL Nedcar has a production capacity of 240,000 vehicles a year. It produced about 120,000 cars in 2020. It currently produces the Mini Cabrio convertible, Mini Countryman, Mini Countryman-PHEV and BMW X1 for BMW Group. It had 2017 revenue (latest statistics) of €2.3 billion and 4,951 employees in 2019.

Valmet Automotive

Founded as Saab-Valmet in 1968 as a joint venture between the Swedish company Saab-Scania and the Finnish company Valmet, it was established to assemble Saabs as a supplementary factory to Saab's main manufacturing plant in Trollhättan, Sweden. In 1992 Valmet became the sole owner, and the company was renamed Valmet Automotive in 1995. In 2010, Valmet Automotive bought Karmann's roof-component divisions. The acquisition made Valmet Automotive one of the three largest roof system manufacturers in the world. In January 2017, Chinese Contemporary Amperex Technology (CATL) became a 23.08% minority stakeholder in the company.[6] The strategic partnership of Valmet Automotive and CATL focuses on project management, engineering and battery pack supply for electric and hybrid vehicles. Also in 2017, Valmet Automotive concluded the acquisition of Swedish Semcon's automotive engineering services in Germany and Spain, increasing its number of engineers to over 1000. Semcon has been a key engineering and software development contractor to Volvo Cars and other Geely companies as well as to AB Volvo.

The 1991 Saab 900 Turbo Monte Carlo Yellow Cabriolet

6. CATL was founded in 2011. By 2017, it had become the world's largest battery maker. Today, it has a market value of $200 billion, which is more than the combined amounts for the next three largest, LG Chem (South Korea), Panasonic (Japan) and BYD (China). It accounts for about one-half of lithium-ion battery sales in China, the world's largest electric vehicle market.

Its OEM manufacturing customers, following Saab's demise, have been Mercedes-Benz, Porsche, Ford and Opel. It is building the M-B GLC-Class and the next generation M-B compact cars. Its roof systems customers include M-B, BMW, Mini, Renault and Bentley. It had 2019 revenue of €652 million and operating income of €18.1 million.

Magna Steyr

Magna Steyr AG & Co KG is the division of Magna International that manufacturers automobiles. It is a wholly-owned subsidiary operating as a limited partnership based in Graz, Austria where its

primary plant is located. Its business is to develop and assemble automobiles for other companies on a contract basis. That means it does not sell cars under its own brand name.

MAGNA STEYR was founded in 2001 following the acquisition of a majority shareholding position IN STEYR-DAIMLER-PUCH three years earlier. MAGNA STEYR brought complete vehicle assembly capabilities to MAGNA. STEYR-DAIMLER-PUCH traces its history back to 1864 when it produced rifles. In 1918, the first Steyr automobile was built. As STEYR-DAIMLER-PUCH, it produced vehicles for FIAT and MERCEDES-BENZ, including the MERCEDES G-Class which was also sold as Puch G. MAGNA STEYR developed MERCEDES-BENZ's *4Matic* all-wheel drive (AWD) system, and was the sole manufacturer of all *E-Class 4Matic* models between 1996 and 2006. The company was also instrumental in development of the BMW X3, and manufactured all of the original X3s. It produced the ASTON MARTIN Rapide and developed the AUDI TT, FIAT Bravo and Peugeot RCZ. MAGNA STEYR also manufactured the roof system for the INFINITI G37 Convertible in addition to the roof system for the NISSAN 370Z Roadster.

Mercedes-Benz G 500/Puch G

In 2010, MAGNA STEYR acquired a portion of WILHELM KARMANN GMBH when it filed for bankruptcy. WEBASTO and VALMET took the other parts. KARMANN was founded in 1901 and produced automobiles under contract for CHRYSLER, PORSCHE, MERCEDES-BENZ and VW. It was mostly known for its work on convertibles and coupés. It produced a total of 2.6 million VW Beetle Cabriolets between 1949 and 1989. The name is mostly connected to the Karmann Ghia, an iconic variation of the Beetle built on its frame in cooperation with CARROZZERIA GHIA in Torino. Effective 25 February 2010, the Japanese production site of KARMANN was acquired by MAGNA INTERNATIONAL.

A 1962 VW Karman Ghia

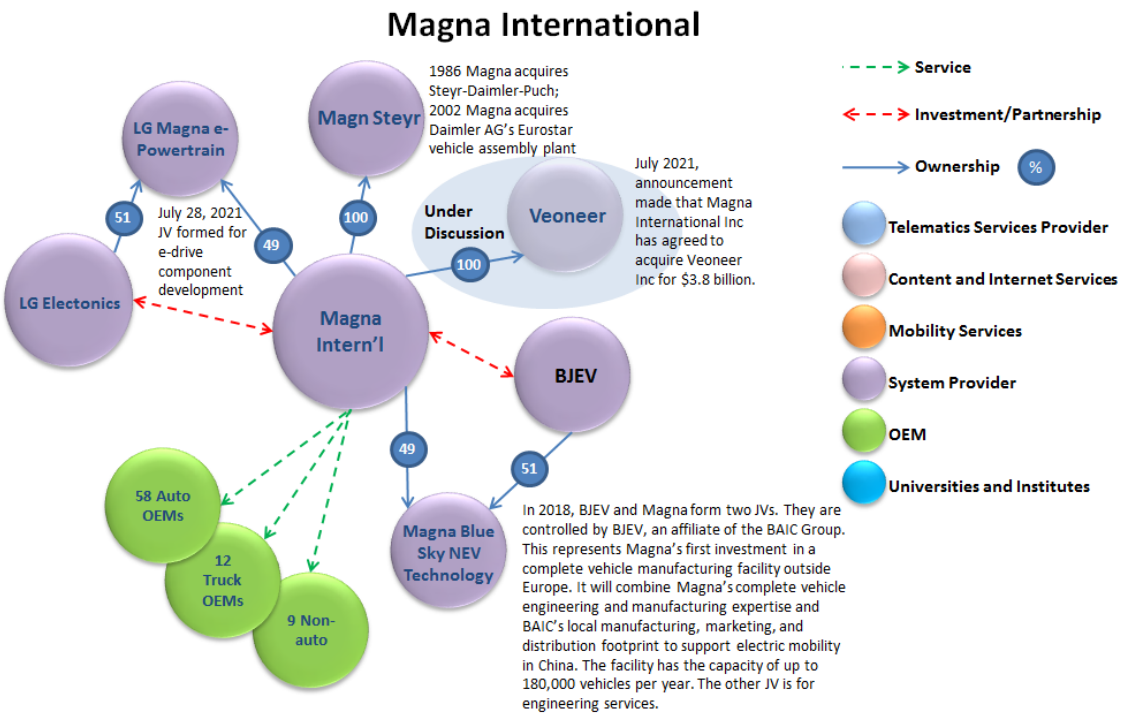
In 2017, MAGNA STEYR had two important announcements. The first was that it would produce BMW's new 5-series plug-in hybrid. The second was that it was chosen by JAGUAR LAND ROVER to manufacturer the Jaguar E-PACE. A year later, JAGUAR selected MAGNA STEYR to build its first all-electric car, the Jaguar I-PACE.

Next up is to open a manufacturing plant in the U.S. MAGNA STEYR president, Frank Klein, says all that is needed is a customer.

Magna has gathered all of the production threads

What MAGNA INTERNATIONAL has accomplished is impressive. We don't know if its Austrian-born and Canadian-naturalized citizen, Frank Stronach, had a vision back in 1956 when he founded what

would become MAGNA INTERNATIONAL LTD that sixty-five years later his company would not only be serving the automotive manufacturing titans, but dining at the same table. Given the methodical manner in which the company grew, both organically and through strategic acquisitions, I have to believe that he had a good idea where he wanted to go.



European Automotive Telematics Landscape
Michael L. Sena

MAGNA describes itself as follows: *"Our deep roots in the auto industry go back to 1957, when we began working with General Motors. Today, we make everything from seats to powertrains and are the only auto supplier to build complete vehicles."* None of its auto supplier competitors have yet entered the complete vehicle supplier category. There is a good chance one or more of them will, and there are at least two good acquisition candidates to help them enter the market. In the meantime, MAGNA is in a unique position.

AUTOMOTIVE NEWS 2020 Top Ten Global Suppliers to the Automotive Industry

Supplier	2019 Rank	Sales (billions)
1 Robert Bosch	1	$46.52
2 Denso	2	$41.13
3 ZF Friedrechshaven	5	$33.40
4 Magna International	3	$32.65
5 Aisin Corp	6	$31.94
6 Continental	4	$29.68
7 Hyundai Mobis	7	$25.07
8 Faurecia	8	$17.58
9 Lear Corp	9	$17.05
10 Valeo	10	$16.95

Two joint ventures have strengthened MAGNA's position in two key areas: electrification and manufacturing in China. In July 2021, LG ELECTRONICS and MAGNA signed a joint venture agreement and formed a company to be called LG MAGNA E-POWERTRAIN that will be headquartered in Incheon, South Korea. The CEO comes from LG and the COO from MAGNA. The joint venture unifies MAGNA's strength in electric powertrain systems and automotive manufac-

turing with LG's expertise in component development for e-motors and inverters. The new company will develop powertrain components that offer automakers everything from complete solutions enabling electrification and functionality to integrating intelligent operating software and controls in new e-drive systems.

The second JV is with BEIJING ELECTRIC VEHICLE (BJEV), the electric car subsidiary of Chinese car manufacturer BAIC. It will operate under the name MAGNA BLUE SKY NEV TECHNOLOGY. There will actually be a third JV that will be set up to offer engineering and complete vehicle manufacturing capacity to multiple companies. These moves solidify MAGNA's presence in China.

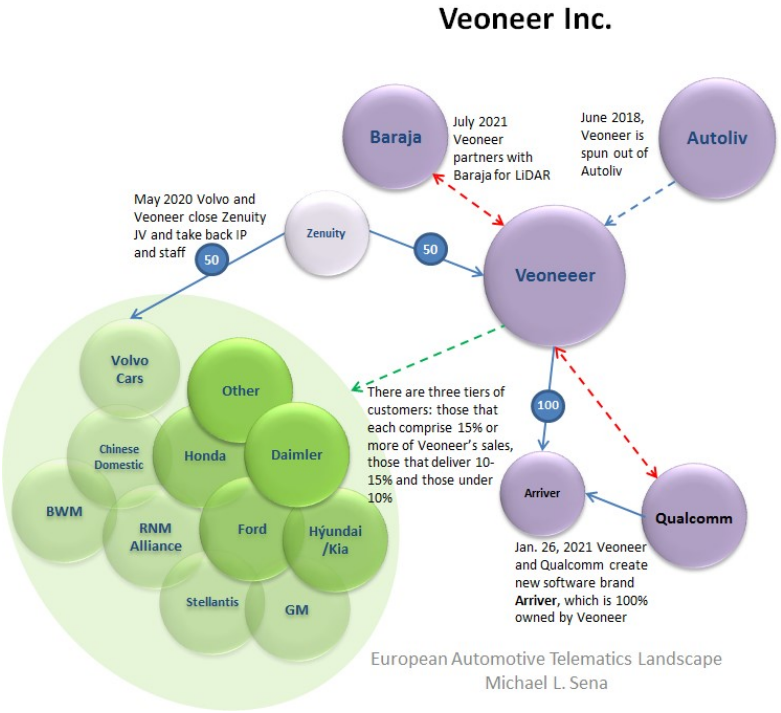
The bridesmaid wants to be the bride

VEONEER is an excellent fit with MAGNA. It bolsters MAGNA's already strong sensor business and it provides a boost to the advanced driver assistance systems software capabilities that MAGNA already has. Like MAGNA—as well as ZF, CONTINENTAL, ROBER BOSCH, VALEO and DENSO—VEONEER is currently a member of the *ADASIS FORUM*. The proverbial 'fly in the ointment' for the MAGNA/VEONEER tie-up is the agreement between VEONEER and QUALCOMM TECHNOLOGIES, INC. that was announced in August 2020 and consummated in January of this year. VEONEER has set up a separate, standalone software development unit called *Arriver*. It is 100% owned by VEONEER, but it operates under "specific information handling protocols and reporting structures as part of its collaboration with QUALCOMM" VEONEER says in the press announcement for the *Arriver*. Here is how the companies describe what they are doing.

The Arriver platform will address the growing needs of the automotive ecosystem for scalable and upgradable solutions, which requires highly advanced and power-efficient compute, connectivity and cloud service capabilities across all vehicle tiers. The system integrates Veoneer's next-generation perception and driving policy software stack and Qualcomm Snapdragon Ride ADAS/AD scalable portfolio of System on a Chip (SoC) and Accelerators. Veoneer and Qualcomm Technologies have worked together for several months to create a world leading roadmap of a scalable, open ADAS and autonomous driving system that will be able to address the entire automotive OEM market with an integrated software and SoC platform.

"We are pleased to take the next step with the announcement of the Arriver perception and drive policy software stack running on Snapdragon Ride, which allows a pre-integrated and pre-validated platform to be offered by Qualcomm Technologies to automakers and Tier-1 suppliers," said Nakul Duggal, senior vice president & GM, Automotive, Qualcomm Technologies, Inc. *"This collaboration expands our joint value proposition and focuses on solving the increasing complexity of ADAS and autonomous driving platform deployment faced by automakers and Tier-1 suppliers."*

Arriver is the principal reason QUALCOMM does not want the deal with MAGNA and VEONEER to go through, and is willing to pay a premium above MAGNA's offer. MAGNA has tied itself to a consortium that includes QUALCOMM's sworn enemy: Intel. In 2017, BMW, INTEL with its subsidiary MOBILEYE formed a partnership to develop highly and fully automated driving technology. MAGNA, DELPHI, FCA (now STELLANTIS) and CONTINENTAL eventually joined. MAGNA will help customize computing systems designed by the partners to make them adoptable for integration by multiple automakers.



European Automotive Telematics Landscape
Michael L. Sena

Once MAGNA owns VEONEER, there seems to be nothing preventing it from either continuing *Arriver*'s special relationship with QUALCOMM or disbanding the special group and reincorporating the *Arriver* team into mainstream MAGNA and making its expertise available to all customers, including INTEL. This appears to be too large a risk for QUALCOMM to accept. The fact that, thus far, MAGNA has not commented on the competing bid and the opening of discussions between Veoneer and Qualcomm means that Qualcomm needs VEONEER more than MAGNA and MAGNA may be satisfied with picking up the non-*Arriver* pieces when QUALCOMM decides to divest them. It's spare change for QUALCOMM in any case. QUALCOMM has a market capitalization five times that of MAGNA.

Will Apple beknight Magna or Foxconn/Geely?

It is only a matter of time before APPLE and other brands put their own names on cars. If GANT can do it with dress shoes and watches, previously the domains of companies like ALLEN EDMONDS

and LONGINE employing highly skilled craftsmen, why can't APPLE put its name on a car? There are two reasons it has taken APPLE or DISNEY or COCO-COLA or LOUIS VUITTON or any of the other best-known brands so long to do it.[7] The main one is that the car companies have been unwilling to rebadge their cars or serve as a contract supplier of the car and everything else necessary to put and keep cars on the road. APPLE's unfruitful discussions with HYUNDAI/KIA about building its car is a clear example of how difficult it is for car companies to put themselves into a supplier position when they have been 'King of the Hill' for their entire history. Another example is FISKER INC.'s similar experience with VW.[8]

The second is that not all of the automobile manufacturing, sales, operations, maintenance, parts and accessory threads were exposed for an outsider. As I have showed here, they are now, at least to the point where APPLE can put on the finishing touches. APPLE's big decision is whether to place a bet on its principal iPhone supplier, FOXCONN, that has zero car manufacturing expertise and experience, or whether it will hand the car design and building contract to MAGNA. If APPLE chooses FOXCONN, FOXCONN will turn over the heavy lifting to GEELY, which is trying to position itself as both a contract manufacturer and a manufacturer of its own cars. In January of this year, GEELY signed a joint venture agreement with FOXCONN to provide car production services. The two companies will hold 50% each of the JV. This is obviously an attempt by FOXCONN to secure the APPLE business.[9]

This will not be an easy decision for APPLE. Politically, selecting MAGNA would be the safer choice if APPLE intends to sell the bulk of its cars in North America and Europe. FOXCONN is a Taiwanese-headquarted company but with a major portion of its production in the People's Republic of China. Choosing it as its iPhone provider might have been viewed favorably back then, but FOXCONN is not a favorite in DC these days, after promising the former President that it would invest $10 billion in a new plant in Wisconsin that would generate 13,000 new jobs over a fifteen years, and now saying that its investment will be closer to $300 million with a few hundred jobs. To appease critics, GEELY could produce the car for FOXCONN in the VOLVO CARS plants in South Carolina, Gothenburg, Sweden or Gent, Belgium. It might simply come down to money, who offers APPLE the best price and delivery terms.

Whoever is chosen by APPLE is less important than the implications of a non-OEM offering a car to consumers. MAGNA may not get this

7. These companies are among the top ten world's most valuable brands according to Forbes. Google, Microsoft, Amazon, Facebook, Samsung and McDonalds round out the list. Toyota is #11, Mercedes-Benz is #23, BMW is #27 and Honda is #29. There are no other automobile companies among the top 50. https://www.forbes.com/the-worlds-most-valuable-brands/#79def79119c0

8. In July 2020, just prior to going public through a SPAC merger with Spartan Energy Acquisition, FISKER was in talks with VW to use its MEB EV platform for its Ocean Electric to speed development and cut costs. While talks were ongoing, FISKER was valued at $2.9 billion with a share price of $23.86. VW closed off discussions and FISKER proceeded with the SPAC in October 2020 with a share price of $10. Also in October, FISKER and MAGNA announced that the Fisker Ocean would be built by MAGNA in Austria. In a joint press release it was stated that the vehicle would "leverage MAGNA's EV architecture combined with the FISKER-Flexible Platform Adaptive Design (FF-PAD) to create a lightweight, aluminum intensive platform for the Fisker Ocean."

9. https://www.cnbc.com/2021/01/13/foxconn-teams-up-with-chinas-geely-to-build-cars-for-other-automakers.html

contract, but there is a long list of major brands that will lining up to offer cars along with shoes and watches that bear their names.

The traditional OEMs will have to weave a new tapestry

Every CEO and management team at every automotive OEM should be camping out in their office (not at an off-site resort where the *après le travail* is in the back of everyone's mind, rather than the work at hand) discussing and deciding on how they will meet this new challenge. They need to have answers to the six important issues listed below. Everything boils down to whether a company believes it can compete with brands like APPLE in a way that will make their brands attractive enough for people to drive them, whether those people are buying, leasing or renting their cars.

1. Build your own cars, outsource production or build for others

The semiconductor industry offers an informative example of what is happening in the automotive industry. INTEL CORPORATION has been the market leader in semiconductors and microprocessors and the world's largest semiconductor chip manufacturer by revenue. It has twice the revenue and profits of TAIWAN SEMICONDUCTOR MANUFACTURING CO, its closest competitor. The difference between the companies is that INTEL has produced chips for itself while TSMC, a foundry, produces chips for fabless chip designers like QUALCOMM and NVIDIA. Most, if not all, of TSMC's growth is the result of that difference. If INTEL had divided its manufacturing into in-house (***intel inside***) production and production for fabless customers, TSMC may not even be in existence. In March 2021, Intel's new CEO, Pat Gelsinger, said that INTEL will invest $20 billion in two new chip factories and start a new division, Intel Foundry, to begin producing chips on a contract basis. There was a brief, nail-biting period when the company was actually considering outsourcing production of its own designs, in other words, going fabless. That period has passed. There's another important point to consider: Intel Foundry plants will be in the U.S. and Europe.

BMW, VW, MERCEDES-BENZ and all the others that outsourced both model development and manufacturing to contract manufacturers like MAGNA did so to reduce their own costs and avoid excess capacity when their sales retreated during economic downturns. Like Intel, they created their worst competitors, because now MAGNA, GEELY and lots of other Chinese companies are just waiting to start producing all those cars that are coming off the drawing boards. It is not too late for GM, FORD, M-B and all the others to do what INTEL has now decided to do.

2. Keep the dealer network, sell in stores or just sell direct

TESLA's CEO has waged a verbal crusade against car dealers, but if you look at what TESLA actually does, rather than what Elon Musk says it wants to do, it offers the worst of all worlds. It has places where people go to touch and feel the cars, where they can get help to order the car they want and fill out all the forms that are needed to buy or lease one. There are not as many of these as there are car dealers of any brand save possibly LAMBORGHINI. TESLA wants everyone to believe that their cars never require service, which, of course they do, but when they break down places where they can be services are few and far between.

Dealers will probably help to answer this question by just saying no to OEMs and selling their own branded cars, having them produced by MAGNA and eventually other contract manufacturers. The choice may be narrowed to owning your own dealerships, like VOLVO has started doing in Sweden, or selling on-line and outsourcing everything else to third parties. The dealer networks that land the contract with APPLE to prep, deliver and service their cars, will show the OEMs how they can do a much better job than TESLA is doing with its hodgepodge of sales and service solutions.

3. Sell cars or offer them on subscription

No one has been able to show that the subscription model results in higher profits for the OEM than the dealer sales model. It has not been for lack of trying. There is one good reason for the OEMs to put their names on the title of ownership of their cars: as the owner, they can decide what is done with the data that is generated. This has limits since the EU's General Data Protection Regulation extends its tentacles out to cover the users of products, not just owners. Whether the value of the data in real terms exceeds the money in the bank they receive from selling cars, parts, services and accessories remains to be seen. As a hint, neither Google, FACEBOOK, APPLE nor AMAZON give away or rent smartphones, laptops or TVs, or subsidize the cost of in-vehicle infotainment systems or any other kit which folks use to drop pennies into their collective pockets.

Have you ever wondered why car rental companies don't manufacturer the cars they rent? There is a lot of money tied up in the equipment needed to build cars. Workers' salaries and suppliers' invoices have to be paid. Car rental companies can amortize the one-time cost of a car over its useful life, which is between four and twenty-two months, but it could not amortize the cost of

building those cars. One more thing. Rental car companies have not been very good investments. [10]

VOLVO CARS is buying dealers in Sweden because the dealers they don't own have told them in no uncertain terms that the subscription model, *Care by Volvo*, doesn't work for them. If it does not work for them, they aren't going to do it, so VOLVO has had to find an alternative. It's going to have to buy a lot of dealers if that is what it believes it will need to do to make subscriptions work for it. Maybe that is where it is planning on using the money it will earn from the newly planned IPO. LYNK & CO, another Geely company that is partly owned by Volvo Cars, is heavily promoting a subscription model.

4. Do software development in house or outsource

VW in one breath says it is all-in on having its own software development team (they call it ***Car.Software***), and in the next breath says it is enlisting MICROSOFT to help it achieve its objectives. What will MICROSOFT say about its cooperation with VW when MICROSOFT is selling its own-branded car? Most car OEMs sent their electric and electronics engineering departments to their suppliers or simply disbanded them in the mid-90s. They have been trying, mostly unsuccessfully, to build them back since then. Instead of hiring staff, they pay IT houses to put their staff on seats at the OEMs' offices and dispose of them at the first sign of a downturn.

If the OEMs believe they have a future in producing cars that people will want to buy because they have the most advanced and the most dependable software, they will be doing what Magna is doing, buying promising companies to internalize the expertise. This is what Google, FACEBOOK, MICROSOFT, APPLE and all the companies that will be branding their own cars in the near future have done. GM acquired CRUISE in 2016, but treats it like it is an experimental investment that it will either sell, publicly list or just let it continue doing whatever it is doing. CRUISE has taken money from SOFTBANK, HONDA and MICROSOFT and is even acquiring companies (VOYAGE in March 2021).

If you truly believe you can compete with the likes of APPLE, or even GANT, you need to make sure that you are not commoditizing your product by putting your badge on someone else's intellectual property. Tesla has been designing its own chips since 2016. VW says it will start to do the same. If you are going to succeed at building cars, you are going to have to do more, not less.

10. As a general rule, rental car companies buy a large portion of their vehicles subject to repurchase or depreciation programs with the vehicle manufacturers. Under these programs, manufacturers agree to repurchase the vehicles at a specific time and/or price in the future, subject to certain conditions, or to guarantee the depreciation rate on the cars throughout the holding period.
The Motley Fool

5. Keep infotainment in-house or give it to a third party

Is turning your infotainment operating system over to Google or APPLE or ALIBABA or any one of the techmasters a good idea? A few OEMs, including VOLVO CARS, thinks it is. They claim their customers prize the fact that their car and their smartphone deliver the same content and have the same look and feel. I wonder if those VOLVO CARS customers who are iPhone fanatics, rather than Android adherents, feel the same way. I know I am not alone when I say I don't do anything Google. Nothing. Nada. It would be enough to keep me from buying a VOLVO if Android was all it had to offer. Are people buying VOLVOS which have the Android OS solely for that reason? Does VOLVO keep statistics on people who tell them they did not purchase a specific model because it is not to their smartphone taste?

When APPLE sells a car with its name on it, I will expect that it is all APPLE, not a little SAMSUNG here or a little HUAWEI there with a Google sauce on top. When Google puts its badge on its car—which surely will someday—I don't expect it will be offering APPLE steering wheels and FACEBOOK seats as accessory options. By the way, TESLA is not among the *Forbes Top 50 brands*.

6. Develop ADAS in-house or outsource to a third party

We are back to where this article started. Is ADAS the base for the future of highly automated and driverless cars, or will driverless cars be born with wings and a flying gene? TESLA is living (or dying) proof that even if you put wings on your car, it has to be able to do the basics that ADAS systems deliver for safe operation. MAGNA has made a bid for VEONEER because it understands this. It needs to strengthen its ADAS offering as a tier one supplier, but it must build better ADAS into it whole car designs. Cars that stop at stop signs and stop lights, stop before they rear end a stopped police car or run over a pedestrian jay walking with her bicycle or decapitate a driver while his car speeds under a trailer crossing the road—cars that do these things and more will be bought and will eventually be the only ones allowed on the roads. Companies like APPLE will not want to put their names on cars that cannot do these basic functions. MAGNA seems to appreciate this. The OEMs gathered in their offices to discuss their futures should appreciate it as well if they intend to build cars under their own brand or the brands of others. It's 'make your mind up time' folks.

I don't know how old my stagecoach doorstop is. It has been in my family for as long as I can remember. My father inherited it from his parents, and at some point my father decided that I should be its keeper. I'm not sure where it goes next.

Dispatch Central

What is an Ignition Interlock Device?

Ignition interlock devices (IID), also known as car breathalyzers, connect to your car's ignition and require you to blow into a mouthpiece before you can start your car. The mouthpiece connects to the device, which measures your blood alcohol concentration (BAC). If your blood alcohol concentration exceeds the limit set by the law, the IID will prevent you from starting your car for either a set amount of time or until you provide a clean breath sample.

In order to prevent samples taken from other people, most ignition interlock devices will also require you to periodically provide a breath sample while you drive, which is known as a rolling retest. If your BAC is over the limit, the device will log the event and sound an alarm until you shut off the engine or provide a clean sample.

https://www.lowcostinterlock.com/ignition-interlock-information/can-interlock-devices-detect-drugs/

Finally, a U.S. mandatory alcohol lock law

The U.S. Congress woke up and smelled the liquor breath

YOU HAVE BEEN reading in *THE DISPATCHER* since I started writing it that there is no reason vehicles should be allowed on the roads with drivers who are unable to safely control their cars due to the effects of alcohol or drugs. Alcohol locks work, and if there was a market for them, drug locks could be developed as well. They should be obligatory in all new cars when they come from the factory and should be required to be retrofitted in every car currently licensed to drive on the roads. No exceptions. The EU mandated this two years ago. A November 2019 EU Regulation 2019/2144, applicable to new cars from July 2022 makes compulsory the *alcohol interlock installation facilitation* for all motor vehicle categories. The U.S. is now on its way of doing so as well. High time.

On August 10th, 2021, with 68 yes votes vs. 29 no votes, the United States Senate passed the *INVEST in America Act (H.R. 3684)*, a $1 trillion infrastructure bill that has been a foundation stone in President Biden's economic platform. Its passing is doubly significant because it received bipartisan support in its passing by the Senate. The bill includes a provision that directs U.S. regulators to mandate a passive technology to prevent intoxicated drivers from starting vehicles with the potential to prevent more than 10,000 deaths annually and save close to $250 billion per year in economic and societal costs. The legislation has been pushed by the advocacy group *MOTHERS AGAINST DRUNK DRIVING* (*MAD*D) since its founding in 1980. Other supporters were the auto insurance industry and some alcohol trade associations.

This isn't happening overnight, unfortunately

Questions remain, however, whether the technology is accurate enough for widespread use and which one would be adopted. The Senate bill does not specify the technology but said it must *"passively monitor the performance of a driver of a motor vehicle to accurately identify whether that driver may be impaired."*

The bill requires the U.S. Department of Transportation to set a technology safety standard within three years, and then give automakers at least another two years to comply - as long as new requirements are "reasonable, practicable, and appropriate." The bill said if regulators do not finalize new safety rules within ten years, the department must report to Congress.

Senate Majority Leader Chuck Schumer, D-N.Y., praised the bill's passage:

"It's been a long and winding road, but we have persisted and now we have arrived," Schumer said from the floor. "The American people will now see the most robust injection of funds into infrastructure in decades."

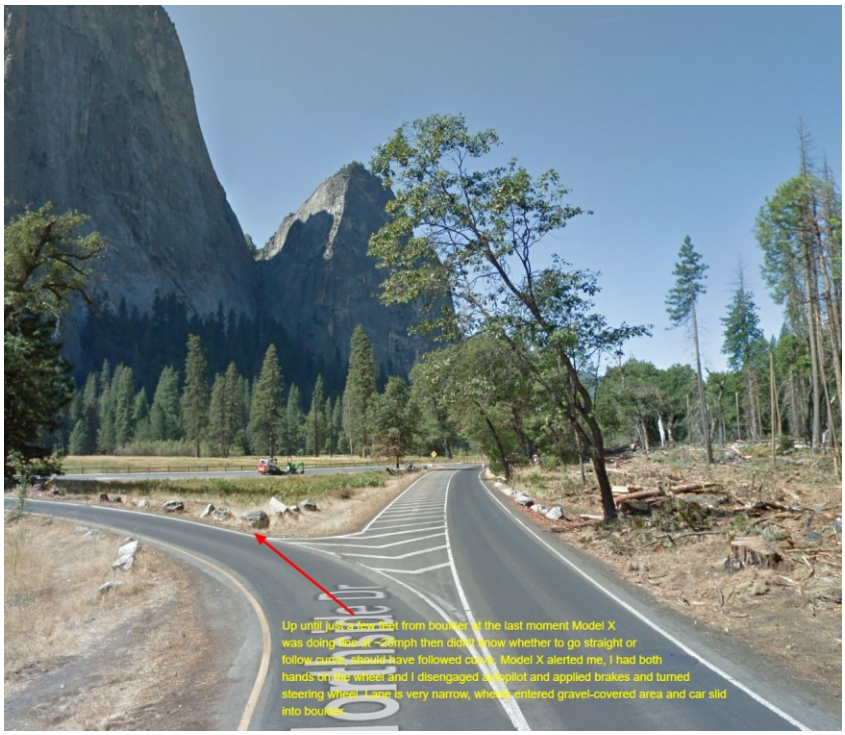
Following Senate approval, the bill was sent to the House of Representatives for a final review before it is sent to President Biden for his signature. There does not appear to be any objection to the Senate's version of the Infrastructure bill, but there is a faction in the House of Representatives call the "progressives" who have stated that they will not approve the Infrastructure bill until the Senate passes a $3.5 trillion bill that is focused on poverty, health care and climate change. Nancy Pelosi, the Democratic congressman and Speaker of the House, said she would not bring up the Infrastructure bill until the Senate passes the $3.5 trillion budget proposal. The bill only needs to be passed by a simple majority, which the Democrats have (50-49), but it may not be possible to keep all Democratic senators on-side. Senators Joe Manchin, D-West Virginia and Kyrsten Sinema, D-Arizona, are not at all certain they support it.

Keep in mind that what the Congress giveth, the Congress can taketh away. The government mandated that vehicles sold after August 1973 would require drivers to fasten safety belts before the cars could be started. In 1974, Congress passed legislation reversing mandatory seat belt interlocks on automobiles.

Tesla meets its fork in the road—and fails

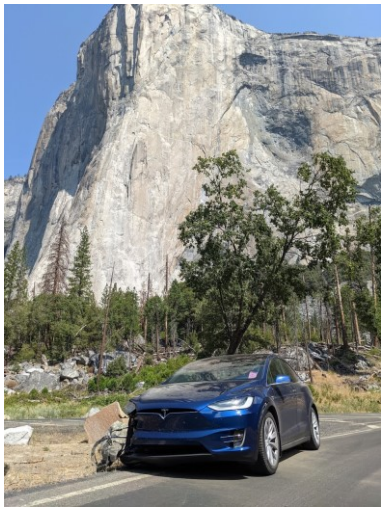
YOGI BERRA WAS once asked if he had any advice for young people on how to succeed in their chosen profession and in life. He replied: "When you come to a fork in the road, take it." The TESLA programmer working on the fork-in-the-road algorithm that is part of the company's Full Self Driving (sic) product doesn't seem to have heard that advice. If a human is driving and the road forks, he takes one tine or the other. He does not split the difference.

This is a two-tined fork.



"Up until just a few feet from boulder at the last moment Model X was doing fine at around 25 miles per hour then didn't know whether to go straight or follow curve, should have followed curve. Model X alerted me, I had both hands on the wheel and I disengaged autopilot and applied brakes and turned steering wheel. Lane is very narrow, wheels entered gravel-covered area and car slid into boulder."

A TESLA Model X owner was driving in Yosemite National Park on a road that bifurcated. The car was in Full Self Driving mode, but the car was unable to determine what to do and ended up driving straight into a boulder between the two lanes. The photo above was taken by the Model X camera and posted by the driver. It is annotated by the driver. I have transcribed what he wrote so that it is easier to read (see sidebar). The arrow in the photo points to the boulder the car hit. The photo to the right shows the car and the boulder which incapacitated the vehicle.



https://www.reddit.com/r/SelfDrivingCars/comments/oxhbit/5_tesla_accidents_in_same_location_in_yosemite/

The driver went out quickly on social media with a post to other drivers and to TESLA, but it took a little while before he posted the photos. Here are four comments he received from different individuals before the "proof" appeared:

- It's quite possible that it was not realistically preventable by the driver. The boulder is barely off the right side of the curve. All it takes is a split second of not keeping with the curve, then the car is in the gravel and can't steer or stop well.
- Just replying to top comment...Looks like OP after 2 days has yet to post video after he claims he has proof of his story. Safe to say his story is BS. Another person who made a mistake but can't admit it so looks to blame someone or something else.
- Hell of a view though.
- His Tesla just got overexcited and wanted to do a little rock climbing itself.

After the photo was posted, the writer of the first bullet above wrote this:

- Thanks for posting the follow-up. Sorry about all the negative "Monday morning QBs" who think something like this could never happen to them. Very typical internet comments, just ignore them. The video showed what I expected. When you're on a curve, it only takes the slightest misdirection to quickly go off the road, less than 1 second. And when it's gravel, it's even harder to recover. Here's a clip of the portion of the video from when the car goes off the road to hitting the rock. All that happened in 0.9s. Remember that the average human reaction time is about 0.25s. By that time, the car was already in the gravel. So even with correction, it was doomed to hit the rock by its momentum. https://streamable.com/jsg6afas

The driver was asked for more information and clarifications. Was he on Autopilot or in *Full Self Driving* or *Full Self Driving Beta*, they asked? He responded that he was on *Full Self Driving*:

"I was in the left lane, going left to a stop sign, preparing to stop at the stop sign, very alert... slow speed, and vehicle before has navigated similar lanes with no issue, I was following the steering wheel with both hands on it, even gripping it, not floating my hands in the air ready to take control as so many drivers do. It was doing fine, I was doing fine, it then jerked just a tiny bit to the right so I turned steering wheel left and applied brakes... since this is such a narrow lane, and not more than a few inches of gravel-covered asphalt past the line, then gravel/dirt, brakes didn't help, turning wheel didn't help, I slid into the boulder…I'm financially able to weather it, if I wasn't I wouldn't be owning the vehicle."

That last sentence says quite a lot. It turns out that this is not the first time a TESLA has hit this particular boulder in Yosemite. The driver starts his posting by saying:

"5 Teslas (including mine) have had accidents at this very same spot in Yosemite... Rangers told me 3 Tesla accidents in the past here, then my accident... a local stopped to tell me their Tesla always has issues here and also say there've been multiple accidents here... then just today my tow truck driver sent me pictures of another accident with a Model S last Friday - that's 5 that I know of."

If you were the local TESLA club president, wouldn't you have gone out to Yosemite and either moved the boulder or put up a warning sign half a mile up the road telling drivers to **Turn Off FSD-It doesn't work here**.

TESLA has apparently not commented on this incident, neither to the press nor to the owner. Its official stance when their Autopilot or Full Self Driving functions fail has been that the driver has full responsibility, even though the driver has shelled out 10Gs, ten large ones, ten dimes, 10K for the privilege of owning FSD.

Do BEVs cost more to service than ICE vehicles

COMPANIES SELLING BATTERY electric vehicles, which, until recently was basically TESLA, would like you to believe that once you have spent two-to-three times more to buy one of their vehicles versus buying a comparatively sized and specified ICE vehicle, you will have inconsequential costs to service and maintain their vehicles. There's been precious little factual information available to bolster or counter these claims other than what might be gleaned from TESLA or other brand-specific chat groups. Now there is. A recent study by a reputable business analytics company called WE PREDICT that is focused on the automotive and fleet management markets found that after three months of ownership, BEVs were 2.3 times more expensive to service and maintain than ICE vehicles.[11] After one year, BEVs were down to 1.6 times more expensive to service and maintain than ICE vehicles.

WE PREDICT's *Deepview True Cost Report* looked at the first ninety days of vehicle ownership and the associated costs. The study is based on 2021 model year vehicles in twenty-one model segments, including 801,000 vehicles across 306 models. The study used 1.6 million actual service or repair orders from both dealerships and independent repair shops. Not included in the costs are initial purchase costs, fuel (gasoline, diesel, biofuel or electricity), inspections or insurance. These costs also do not include the price of meals and beverages that are consumed while the BEVs are charging along the road.

The principal finding of the analysis is that electric vehicles will cost their owners, on average, $123 (€105) in the first 90 days. That is more than double what an average ICE vehicle would cost ($53/€45) during the same time, and triple the cost of a hybrid ($46/€39). WE PREDICT is quick to say that this does not mean the BEVs are unreliable and require more visits to the workshop. It is the result of the costs of repair being higher, just as they are with luxury (i.e., higher cost) cost vehicles. BEVs are, after all, higher cost vehicles even though they may not be luxury vehicles. Either the parts are more costly or the time it takes to make the repair is longer. Parts average $65 for BEVs, compared with $28 for ICE and $24 for hybrids. Labor costs for working on BEVs average $58, versus $25 for ICE vehicles.

"Vehicles that have low service and warranty costs at three months tend to have low costs at three years," says James Davies, WE PREDICT founder. "Our predictive analytics show that problems

11. WE PREDICT is a Michigan-based data analytics firm. The company assists customers, principally in the automotive sector, to anticipate and accelerate decisions on products, markets and financial performance. Deepview True Cost Report https://carbuzz.com/news/study-finds-evs-dont-have-the-reliability-we-were-promised

incurred in the first three months of service often indicate how the vehicle will perform over its lifecycle. Vehicle quality doesn't get better with age."

The report says that the cost at three months is multiplied by 15 at 36 months and 20 times by five years of ownership. That would result in the average BEV owner dishing out $2,460 in service by year five versus $1,060 during the same period for an ICE vehicle.

Sounds like an open and shut case, but not so fast

On the 13th of August an article popped up one of my news feeds with the evocative title: "A new study breaks down vehicle ownership cost. Here's how EVs fared". The study referred to was performed by the U.S. DEPARTMENT OF ENERGY's *Argonne National Laboratory*. The site reporting on the study is ELECTREK.[12] Here's what they stated as the report's findings: "Maintenance costs of battery electric vehicles are 40% lower than ICE vehicles."

12. *ELECTREK* says it is a news and commentary site that is tracking, analyzing, and breaking news on the transition from fossil-fuel transport to electric transport. It is not ICE friendly.

Interesting. One group siting results from a 227-page report produced by U.S. federal government agency saying one thing and a survey of actual service repair cost orders for 801,000 vehicles saying the opposite. I went to the *Argonne* report to see where they got their numbers. There's nothing like getting the story straight from the horse's mouth.

The 40% lower cost figure comes from the table of comparative maintenance costs (shown right) for Internal Combustion Engine Vehicles (ICEV), Hybrid Electric Vehicles (HEV), Plug-in Hybrid Electric Vehicles (PHEV) and Battery Electric Vehicles (BEV). I found the sources of the data they have used to prepare this table. The report includes data from the Bureau of Labor Statistics (BLS) 2020 Consumer Expenditure Survey, a 2014 article written by Ryan Pfirrmann-Powell which uses BLS data to show that maintenance costs increase with the age of the auto, and information from a web site called YOUR MECHANIC. YOUR MECHANIC is a web-based company that provides on-the-spot repairs for cars.[W]

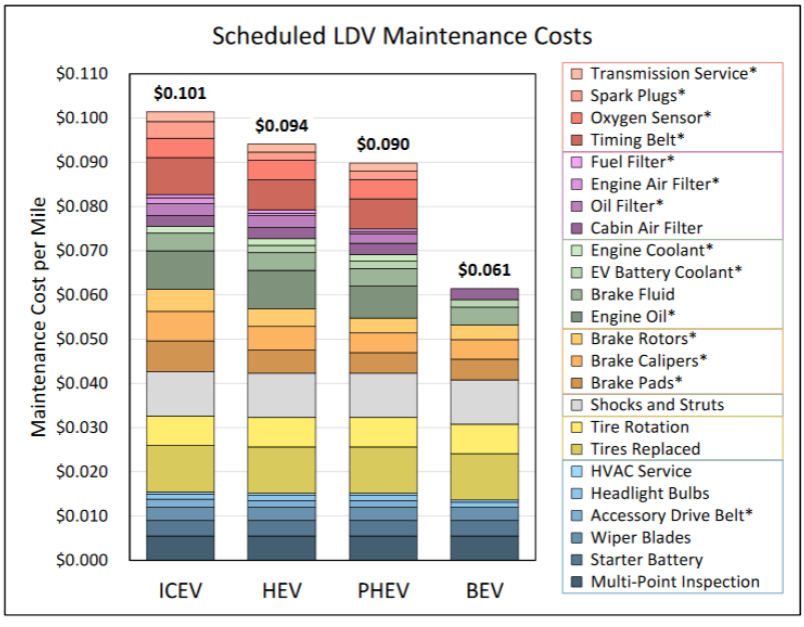


FIGURE 3.28 Scheduled maintenance costs for ICEV, HEV, PHEV, and BEV

Take a close look at the table and you will see how the folks at *Argonne* came up with their number. They listed all the scheduled maintenance items for an ICE vehicle with their average costs as compiled from the various sources, and then they subtracted the ones that do not exist for each of the other vehicles types. They also have determined that certain costs for non-ICE vehicles are lower because service intervals are longer. For example, for the BEV maintenance list, they have removed from the ICE list the accessory drive belt, engine oil, engine coolant, oil filter, engine air filter, fuel filter, timing belt, oxygen sensor, spark plugs, transmission service. The only addition to the BEV list is the EV battery coolant. One obvious mistake is the category Tires Replaced. It is the same for all categories, but the cost of tires for BEVs is double the cost for ICE because of the weight of the vehicles.[13]

There is zero allowance for differentiation in cost that disadvantages the electric vehicles. For some reason that is not explained, the costs for brake pads, brake calipers and brake rotors are reduced for the electric vehicles because the service intervals are increased. Compared to the WE PREDICT study that uses actual costs of repairs for electric and non-electric vehicles, the *Argonne* report appears flawed. It would be like saying that the cost of service and maintenance of a horse and wagon would be almost zero because it does not include most of the items on the ICE vehicle list.

The problem is that headlines like the *ELECTREK* one, "Maintenance costs of battery electric vehicles are 40% lower than ICE vehicles", grabs headlines in places like the *NEW YORK TIMES* and people take it at face value. As the TESLA owner who bit the boulder in Yellowstone Park said, he can afford the extra costs that come with owning a BEV. We don't need to coddle people in order to convince them to buy the cars. Give it to them straight. If you want to play, you're going to have to pay.

Baker Electric: Turn-of-the Century Elegance

THERE IS NOTHING new under the sun, and sometimes old new stuff is right in your own backyard. On a visit during the summer to an antique motorcar museum in the nearby town of Motola, I saw that there was a new addition since I was last there several years ago. A ***1909 Baker Electric Coupe*** that was driven by Sweden's Queen Sylvia during the *Swedish King's Car Rally in 1999* now graced the exhibition floor. The car was rather squeezed in amongst other cars so I couldn't get a good photo of it, but I found a photo of one that is owned by Jay Leno, the American comic and

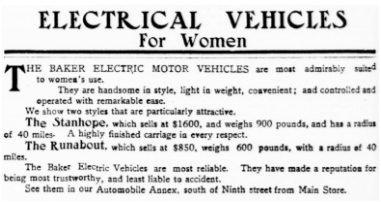
13. The higher curb weight of electric vehicles means that the diameter of the wheels must be greater. Here's what tire-maker Continental says about electric vehicle tire design: "When designing tires for electric cars, Continental gives them increased load-bearing capacity to account for the extra weight of a battery pack. The tread pattern and tread compound are also EV-specific, to handle the nearly-instant torque of electric motors. And to quiet tire noise, a foam inlay is added inside. Continental's tires for electric cars also generally have a "tall and narrow" shape to reduce rolling resistance, which helps increase range." https://www.greencarreports.com/news/1129002_here-s-why-electric-vehicles-need-different-tires

long-time host of the Tonight Show. He and Jerry Seinfeld, another comic and TV personality known best for the show which carries his name, duke it out for the person with the most cars of all sorts that have the highest total value. And, most important, they drive the cars they own. Here is Jay Leno driving his own 1909 *Baker Electric Coupe*. He says that he feels like he's "driving a telephone booth" when he's in the car, but loves the whole experience.

The car was apparently very popular among New York City's wealthy women. As Jay Leno tells it, there were 15,000 of them in the City during the century's first decade, and most of them were driven by women. The car was dubbed the 'Ladies' Shopping Car'. The alternatives at the time were either a steam-driven car (that was sure to turn a white lace dress into a grey mess), or a hand-cranked internal combustion engine (that would require a burly chauffeur to get it started). With the *Baker*, the lady just stepped in, drew down the tiller used for steering, clicked the 'on' switch, twisted the go lever, and off she went. No round trip on Manhattan at that time could possibly be more than fifty miles, which was the range of the twelve lead-zinc batteries.

What happened to BAKER ELECTRIC? The company had a 17-year run, beginning in Cleveland, Ohio in 1899 and ending in 1916. It was founded by Walter C. Baker along with his father-in-law and

The Audi Grandsphere concept BEV with potted plant above, and the Baker Electric interior with flower sconce below. As we said, there is nothing new under the sun. The Baker Electric interior looks more luxurious, don't you think?



ELECTRICAL VEHICLES
For Women

THE BAKER ELECTRIC MOTOR VEHICLES are most admirably suited to women's use.

They are handsome in style, light in weight, convenient; and controlled and operated with remarkable ease.

We show two styles that are particularly attractive.

The Stanhope, which sells at $1600, and weighs 900 pounds, and has a radius of 40 miles. A highly finished carriage in every respect.

The Runabout, which sells at $850, weighs 600 pounds, with a radius of 40 miles.

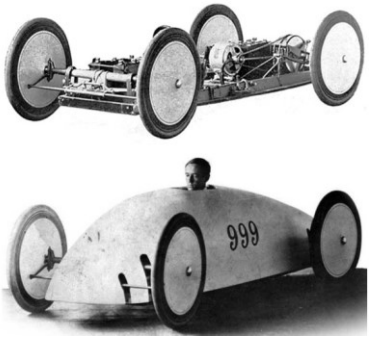
The Baker Electric Vehicles are most reliable. They have made a reputation for being most trustworthy, and least liable to accident.

See them in our Automobile Annex, south of Ninth street from Main Store.

brother-in-law. Their first car was priced at $850, and it was first shown in New York City at the very first auto show. Thomas Edison bought one, and his nickel-iron batteries were used in some of the Baker models. In 1902, BAKER built a model called the ***Torpedo*** which he intended to drive himself to break the world speed record. He was first to pass the 100 miles per hour mark, but gave up his racing car efforts after a few accidents that killed bystanders.

In 1910, a BAKER car set an electric car distance record, travelling 201 miles at an average speed of 12 mph. By 1907 it was producing 400 cars a year. Other notable buyers included the King of Siam, U.S. Presidents Howard Taft and Woodrow Wilson. It merged with Rauch & Lang in 1915, and this company was sold to Stevens-Duryea Co in 1920. The last BAKER ELECTRIC car was produced in 1916. Walter Baker left his own company in 1912 to become supervisor of GENERAL ELECTRIC's OWEN MAGNETIC CO.'s electric car construction.

1902 Baker Electric Torpedo shown above without its body and below with its teardrop-shaped one. There really is nothing new under the sun.



FCC says it's C-V2X in top 30 MHz of 5.9 GHz

IT HAS TAKEN TOO long, but finally we have resolution.[14] The U.S. Federal Communications Commission on the 3rd of May 2021 has decided that the 75 MHz of the 5.9 GHz band which was set dedicated to ITS uses will be split into an upper band of 30 MHz and a lower band of 45 MHz.[15] The upper band will be retained for ITS needs within the transportation and vehicular safety-related ecosystem, while the lower band is repurposed for meet the growing demand for wireless broadband. The Commission said that it has determined that 30 MHz is sufficient for the basic safety applications of the next generation of ITS, and that any services provided in this spectrum should not duplicate information that is already available via other sources or other spectrum bands and alternative technology.

In addition, the FCC has adopted rules designating **Cellular-Vehicle-to-Everything (C-V2X) technology as the ITS delivery system** once the Commission adopts a deadline and the transition to the revised ITS band is complete. Pending resolution of the transition of ITS operations to C-V2X, ITS licensees will be able to continue their DSRC-based operations or, alternatively, to seek to deploy C-V2X-based operations through the Commission's existing regulatory processes.

14. Resolution - a formal expression of opinion, will, or intent voted by an official body or assembled group.

Merriam-Webster

15. https://www.federalregister.gov/documents/2021/05/03/2021-08802/use-of-the-5850-5925-ghz-band

Musings of a Dispatcher: A Sense of Cars

*"In Edward Hopper's **Gas** (1940) artificial lights mingle with the fading day as a lonely worker tends to cherry-red gas pumps that fuel the expeditions of an entire nation." A poetic description of Hopper's painting written by Leah Dolan, CNN in a CNN article on small-town America. The painting is not so much about what is there as it is about what is not there: a car.*

Do you need to have it to build them?

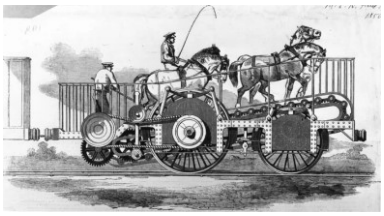
DO YOU NEED to possess a *sense of cars* if you intend to build a car and put it into the hands of people who will depend on it to do its job, and do you get a *sense of cars* only by having worked for a car company? These thoughts came to me as I read Tim Higgins's book, Power Play: Elon Musk, Tesla and the Bet of the Century. Not a single person involved in the founding, funding or initial management of TESLA had ever worked for a car company or built a car. Higgins says that Martin Eberhard, one of the two company founders, "flat out rejected the notion that experienced automotive industry executives from Detroit might be helpful" in running the fledgling company when it was started in 2003. Eberhard, his co-founder, Marc Tarpenning, and their first financier, Elon Musk were all artifacts of the dot-com era, having developed a product or service based on the Internet, sold the result and then defined themselves as serial entrepreneurs who could tackle anything they saw as a problem, whether it was sending a rocket to Mars or developing a car powered by electricity.

What do I mean by *sense of cars*? 'Sense' is one of those words that has multiple meanings. The title of Peter Høeg's book, *Frøken Smillas fornemmelse for sne* has been translated into two English versions: Miss Smillas's Feeling for Snow, which is the British English edition; and, Smilla's Sense of Snow, the American English edition. These differences give an indication that there are subtle variations in how the word is interpreted. A translation from Danish of the word *fornemmelse* is 'sensation'. Smilla did not learn to become aware of the different senses of snow by intuiting or reading about them or interviewing Inuit, true experts on snow. She learned about snow through personal experience and contact, by seeing, for example, what a snowflake did on the ground when the ground was dry and frozen versus when it was wet and warm.

Definitions of 'sense' that I believe apply to *sense of cars* are 'conscious awareness or rationality; discerning awareness and appreciation; a motivating awareness' and, most particularly, 'the capacity for effective application of the

powers of the mind as a basis for action or response'. The meaning of 'sense' that does not apply is the one used by those without experience, 'a faculty of perceiving by means of sense organs—sight, hearing, smell, taste or touch', as in "I have a gut feeling that I am right".

History books are filled with examples of individuals who saw their mission in life to redesign and reinvent how something was built or used, to be a disrupter. The past fifty-or-so years are dominated by inventions related to computers. Why not let computers draw building plans and maps rather than have draftsmen and cartographers? Why not buy a book on the Internet and have it delivered to my house rather than going to a bookstore, or better yet, rather than lugging around a physical book, have one device which I can use to access my entire library digitally? These are fairly rational disruptions that could be tested, both technically and economically. If they worked and people bought them, they could become a complement to existing products or services, or replace them. Architects and engineers no longer draft plans, sections and elevations; working drawings are generated from the design. Cartographers no longer scribe peelcoat and place strings of text manually; maps are generated from various types of digital models of the earth produced with cameras and lidar.



16. The IMPULSORIA - the 1850 machine was invented in Italy by Clemente Masserano to utilize animal power on railways.

17. The DYNASPHERE - an electrically-driven wheel, capable of speeds of 30mph, invented by Mr. J. A. Purves of Taunton and his son.

Alongside these rational disruptions there are many examples of individuals who have a 'sense', a gut feeling, that something is not the way it should be and they are going to fix it. Why go to the trouble of mining coal or burning trees just to drive a train when you have perfectly good horses hanging around?[16] Why waste time driving four little wheels when one big wheel will do the trick?[17] Why continue to be restricted by a document written almost 250 years ago when we can start with a brand new Declaration of Independence, Constitution and Bill of Rights that can be summarized in a Tweet? The United States just went through a four-year experiment orchestrated by an individual who believed he knew/knows best, a person who wanted (still wants) to redesign the job of President of the United States and the jobs of everyone who work in all levels of government. He and Signor Masserano and Mr. Purves and his son personify the meaning of 'sense' that does not apply to *sense of cars*.

Higgins's book describes TESLA, at its start, as a puzzle in process with a management team that had no *sense of cars* and, worse, no sense of how to go about building a car, developing a company

that would eventually sell and maintain every car it sold, and guarantee its safety. Its first car, the *Roadster*, was an IMPULSORIA with a battery pack and electric motor instead of a couple of horses, and a *Lotus Elise* chassis instead of a wagon.[18] Is TESLA still making up its story as it goes, or does it now, after eighteen years, finally have a *sense of cars*?

A car is more of what you don't see than what you see

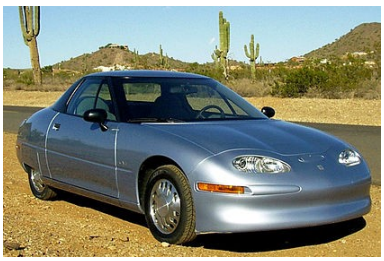
It is understandable that the first inventors of cars thought of the cars as the objects of creation. Motors, drivetrains, transmissions, steering—everything—were new and a potential source of competitive advantage. If it had not been for the invention of the electric starter motor, internal combustion engines would never have caught on. The early inventors built their cars and then started to form companies around them. They came to understand that they needed to have effective processes to build their cars, like Ford's assembly line. They needed to have ways to sell their cars, and the dealer model was created. Oil companies provided the places where cars could be fueled. Insurance companies, repair shops, parts suppliers, motor clubs and countless other participants in the automobile ecosystem got into the act.

Martin Eberhard and Marc Tarpenning could have studied best and worst practices from the over one hundred years of car businesses and built the foundations for a complete business when they founded TESLA. They didn't do that. There wasn't any invention behind their car either. Besides all the electric cars that were sold over a hundred years earlier, GM already had its *EV1* on the street.[19] The idea behind TESLA was simply to build a fast sports car, and an electric motor was the best available alternative for powering the wheels. They talked about how electric cars might be great for the climate, but they had no idea what that meant. They pitched their car as an accelerating adrenalin rush to eventual buyers, like Arnold Schwarzenegger. "Wow! I want one of those. Make it two." They didn't know how they were going to build it, sell it, maintain and service it, and, most of all, pay for it.

There was actually one innovation with TESLA's first car. J.B. Straubel, the company's fifth employee, had injudiciously shared his idea of a battery pack built of lithium-ion batteries of the type found in laptops with Elon Musk and other people who passed it on to Eberhard. This was the one bright idea that was incorporated into the *Roadster*. Straubel had shown that it was possible to rip out the ICE in a *Porsche* and stuff a battery pack and electric motor in it to make it go very, very fast very, very fast. However,

A 2008 Tesla Roadster
It was the first highway legal serial production all-electric car to use lithium-ion battery cells and the first production all-electric car to travel more than 320 kilometers (200 miles) per charge.

18. Eberhard and Tarpenning decided that they would not try to build a car from the ground up. They looked for a company that would provide a chassis and found LOTUS to be one that would. They may have known that Lotus designed the chassis and bodywork for the DELOREAN—the car with the gull wing doors, like the *Model X*.



19. GM's *EV1* battery electric vehicle wandering in the desert, the last place you might expect to find a charging station. Compared to this, the Saturn looked absolutely sporty. It pre-dated the *Roadster* by twelve years.

this was not an invention. Straubel's invention was to pack the cells with a small space between them and then to pour in a non-conductive material in the space to keep the batteries from self-igniting. This was way back in 2003 when TESLA was formed.

Those who have followed TESLA from its start, as I have, know the general outline of its story and some of that story's details. Higgins's book fills all the gaps and adds the details of "hundreds of interviews with company insiders, past and present", court filings and public documents. Musk would not allow himself to be interviewed. Higgins says on Musk's refusal to talk: "Without pointing to any specific inaccuracies, he simply offered this: 'Most, but not all, of what you read in this book is nonsense.'" My bet is that Higgins got the real truth from the people who were willing to talk. During the fifteen-or-so years since 2004 when Musk made his $6.35 million investment in TESLA and had himself named Chairman of the Board, he has 'revised his priors' many times over as TESLA attempted to build its first car, then stay in business long enough to build its second, third and fourth. He was one Elon Musk the day Eberhard's venture capital consultant phoned him to do her own due diligence before they took his money, when he said: "I'm going to be a very wealthy board member and investor, that's all I'm looking for."

Maybe that was what he was looking for then; maybe not. Possibly, he had every intention of taking over every part of running the company, hiring to firing, which became the case as soon as the ink was dry on their contract. More probably, he saw his money going down a dark hole, money he needed to fund SPACEX, which he had founded two years previously and was his ticket to Mars.[20]

20. SpaceX had been founded by Elon Musk in May, 2002.

As it turns out, the more money that Musk was forced to put into TESLA in order to keep it going, the more control he took of the operations. Eberhard first lost his position as CEO and was then fired before the *Roadster* was unveiled. Tarpenning quickly followed. TESLA ran through two more CEOs in quick succession until Musk declared himself CEO in 2008, and he has been there ever since, reportedly the longest serving CEO of any car company among current CEOs. There were dozens of other employees who were shown the door before the founders were booted, including the third employee, Ian Wright. There seem to be more characters who came and went at TESLA than there are characters in Leo Tolstoy's War and Peace (600 named characters in Tolstoy's door stopper). Musk is portrayed in Higgins's book as a person who fires first and doesn't waste a minute thinking after. He personally interviewed

every hire for the first several years, asking them his key question: "What have you done that is extraordinary?" "Getting this interview," was not an acceptable response. If they did push Musk's correct button, they were hired, but if they dared to use their experience to question Musk, they were out the door in a blink of an eye.

One thing is clear, both in the book and from what we see of TESLA today: Musk and everyone around him had no idea what they were getting themselves into when they started TESLA, and up to the time they had chaotic and disastrous introductions of their first three cars, the *Roadster*, *Model S* and *Model X*, they didn't seem to care to find out. Everything became a surprise, from the cost of a change to the *Lotus Elise* chassis that might make it look less like a LOTUS and more like a TESLA, to the angry reaction of Chinese buyers of the *Model S* who, although they had not yet received their vehicles, learned that TESLA was going to be delivering an updated version to North American buyers but not to them.[21] Most cancelled their orders. Veronica Wu, the person who was in charge of building the market for TESLA in China, was fired.

21. There is a reason why there are specific times that models are changed, why those times coincide with the lowering of prices for the previous models, and why information is given shortly before the new models come out so that people don't delay their purchases until the new models are ready for sales. The Chinese buyers wanted the latest models or they wanted a significant reduction in the price they paid for the car they had ordered. Tesla offered neither.

There was a brief period when some positive things began to happen, when it looked like TESLA was gaining a *sense of cars*. When the *Model 3* was a year away from start of production, which would be July 2017, a group was formed by Doug Field to build the new car the right way. Doug Field had joined TESLA from APPLE in 2013, where he was VP Mac Product Design. He had begun his work career at FORD in 1993, where he stayed for six years. Field was head of *Model 3* production. He had a *sense of cars*. He saw how production problems with the *Model S* and *Model X* had damaged both the company's finances and overall morale, and he was determined to make the *Model 3*—TESLA's first real car—from the start. First, he made sure the car was designed to be manufactured on an assembly line, a trait the three previous models definitely lacked. He and his team worked on setting up the production line with both the manual robotic processes coordinated to maximize throughput.

Within a week of presenting the *Model 3* in 2016, TESLA had 325,000 reservations for the car. These reservations represented potential sales of over $14 billion. Field and his team were preparing for a start of production in late 2017 with a goal to produce 5,000 cars per week by the summer of 2018 and ramp up to 500,000 *Model 3*s per year by 2020. It was a stretch, they all

agreed, but it was doable. Then, Musk decided they had to start production in mid-2017 and get up to 5,000 a week in 2017. Musk said the company needed the money sooner. In April, 2018, Musk relieved Field from his responsibilities as chief of *Model 3* production and installed himself in the position. He felt Field was prioritizing quality over output. Field took a leave of absence which ended in July with his decision to leave TESLA and re-join APPLE as the head of its electric car project.[22]

22. Field left APPLE to return to FORD in September 2021 to become chief of advanced projects and embedded systems.

Musk promised the troops a roller coaster—a real one

Difficulties experienced by TESLA and Musk during the company's first fourteen years were nothing compared to the turbulence it would go through in 2017 and 2018. There was an unsuccessful attempt to unionize the workers at the Fremont, California plant. Musk promised to build the employees a roller coaster and offer free frozen yogurt if they did not support the union bid. To the problem of building enough cars to fill pre-orders was added the problem of delivering those cars. It's difficult to do if you do not have proper distribution centers that can prep the cars properly. Tesla ended up having both employees and volunteer TESLA owners driving cars to buyers, dumping them on their doorsteps and taking a taxi back to the parking lot where cars were stored. Then there was Musk's attempt to deliver a mini-submarine to the Thai rescue workers trying to get a group of young boy soccer players out of a flooded cave where they were trapped, which the rescue team didn't want to use. What caused the biggest stir was Musk's Tweet that he was taking the company private and had funding to do so. That earned him a $20 million fine from the *U.S. SECURITIES AND EXCHANGE COMMISSION (SEC)*, and an equal fine for the company. He also had to give up his board chairmanship for three years.

At the beginning of January, 2019, Musk was in Shanghai to make the final arrangements for the start of construction of TESLA's first China factory. In December, the first cars rolled off the assembly line and were delivered to employees. Its stock began an astronomical climb in October of 2019. TESLA delivered slightly more than 500,000 vehicles globally in 2020. It now has 70,000 employees. It's a car company, but does it even now have a *sense of cars*?

Musk as Mephistopheles or Rational Man

There is a definite Faustian flavor to Higgins's narrative. However, it is not Musk in the role of Dr. Faustus who sells his soul to the devil through the middle man Mephistopheles, but Musk who is himself the agent seeking out those who wish more wealth, knowledge and power than they have. TESLA's story is populated

with Fausts, starting with Eberhard. TESLA attracts men (and a few women) who want power and riches and believe that Mephistopheles can deliver these. In the Faustian tale, those who submit to the deal brokered by Mephistopheles are not corrupted by him but are already corrupt, otherwise they would not be willing to turn over their soul for worldly possessions. According to this interpretation, those hundreds of former TESLA employees dismissed by Musk are not victims, but deserve their fate.

For many current and former employees who have held on to their stock, including Eberhard, that fate is rosy, at least from a financial point of view. While the share price is off its all-time-high of $846/share in January of this year, if they received a hundred shares, the price is still high enough to pay for a fully-equipped *Model 3* or a year of college for themselves or one of their kids. The share price started rising in November, 2019 when people who buy stock decided that after sixteen years of struggling to make it, TESLA was going to stay in business and was going to be a major car company.

Maybe Musk isn't Satan's shill after all. Maybe he is the most rational man in the room, even though it looks like he has been winging it from the git-go. Steven Pinker, a cognitive and evolutionary psychologist, who wrote Rationality: What It Is, Why It Seems Scarce, Why It Matters, says rationality is the ability to use knowledge to attain goals. He says that as rational person you have to know things, you have to want things, and you have to use what you know to get what you want. Intentions matter: a person isn't rational if he solves a problem by stumbling on a strategy that happens to work.[23] When Musk invested in Eberhard's and Tarpenning's idea, he said he did so in order to grow his money. He wanted money for SPACEX. He made a calculation of the odds that TESLA would be able to grow his money with the idea of a fast, electric car, figured the odds were good, and bought in. Sounds pretty rational so far. When it became clear that Eberhard and Tarpenning didn't know what he thought they knew, and it looked like the thing he wanted, his money, was about to be lost, Musk started hiring person after person whom he thought would know what was needed, and fired them when it turned out they didn't—or more correctly, when their rational view conflicted with his own. In the end, he decided he would have to do everyone's job if his money was going to be protected, and better yet, grow.

23. These thoughts are expressed in an article titled *Thinking It Through* in *THE NEW YORKER, AUGUST 23, 2021,* written by Joshua Rothman.

Two-thirds of the way through Higgins's book, the picture of TESLA begins to change. Characters appear who are making good decisions and following through on them without Musk's meddling. Amidst the firings and resignations, enough people were hired who did, in fact, know what they needed to know. They managed to stay under Musk's radar. A company was building around a few good people who had a *sense of cars*, who were not stumbling on a series of strategies, but developing rational processes that would build the one car that could take TESLA from a niche car company to the mainstream, the *Model 3*. Not all of these people have stayed. Straubel left in 2019. He wasn't fired.

Higgins doesn't say whether the TESLA factory workers ever got their roller coaster, but both the employees and investors have definitely had a roller coaster ride during the company's eighteen years of being in business. Does it now have a *sense of cars*?

It's still a puzzle in process

Higgins's book confirms what I have thought ever since the *Model S* was delivered: Elon Musk provided the basic concept of an electric car company business concept during the first ten years. When the Supercharger network was starting to be built, that would have been a good time for him to turn over the operations of the company to people who had a *sense of cars*. It seems that he wanted to do that. He is constantly showing signs of anger and frustration that his life is being driven by (his perception of) the need TESLA has for him to make all of the decisions himself, that everything will turn to dust if he doesn't give up his life to save the company from ruin.[24] Musk sees himself alternately as one of two Ayn Rand characters in Atlas Shrugged, John Galt or Hank Rearden. He plays both parts in his business and private lives. He is sometimes Galt, the philosopher and inventor who can sleep in the tunnels and work in the trenches to unite the worthy and lead them to the Promised Land, and Hank Rearden, the proud and skilled industrialist who can build the most successful business machine, but who also has internal doubts and insecurities.

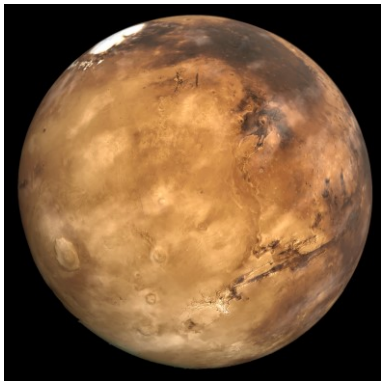
Both of these superhero traits served TESLA well in its early stages, but TESLA needs less drama and more execution if it is going to retain its value. When J.D. POWER finally performed its evaluation of TESLA (although without TESLA's cooperation) and released the results in June 2020, it placed at the very bottom of the list of 33 car makes. It had 250 problems per 100 vehicles, 22 more than LAND ROVER, 25 more than AUDI and 114 more than joint number

24. In July, 2021, Elon Musk said he "rather hates" being CEO of Tesla, telling a court that he would rather focus on engineering and design issues. But he said he had to remain in charge of Tesla "or the company was going to die". The occasion of these remarks was the first day of a trial being held to decide if Musk forced Tesla into a $2.6 billion acquisition of SolarCity, the solar panel company founded by two of his cousins, in order to bail out the failing firm.

ones, DODGE and KIA. TESLA owners who are members of the company's fan clubs shrug at this information: "So what! We love our cars." Would people be buying APPLE *iPhones, iPads* and *Apple Watches* if these products had the worst record for defects? Would people be buying products on AMAZON's platform if there were 2.5 problems for every product they ordered? Apparently, the answer is 'Yes' for well over a million people who have already bought TESLAS.

It is clear to me that I do not understand the mindset of the TESLA buyer. I want to buy my car from a dealer who has years of experience selling and maintaining the cars they sell, rather than picking out the pieces on the Internet and being contacted by someone at a call center who probably doesn't even have a driver's license. I want to know that if I have a problem on the road, I will have a service provider on the scene within an hour or less, and my car will be taken to a place that is minutes, not hours, away. I don't want to drive a car that has not been properly and thoroughly tested before I take ownership of it, even though some of the problems that occur can be fixed with an over-the-air software update. But if there are more than a million people who have bought into TESLA's idea of a car, there can easily be 10 million or 100 million more who like what TESLA represents and who also want to be part of the group who lift off for Mars with Elon Musk.

Elon Musk will continue to add new pieces to the TESLA puzzle as long as he has even the smallest bit to do with the company. As long as he is there, the image that the TESLA puzzle is meant to represent will never be clear to anyone because it is not clear to Musk. He will not resolve his Galt and Rearden personae into a single person who will allow others to have rational thoughts that conflict with his own, however irrational they are. He will never have a *sense of cars* because the cars his company is building are a means, not an end. Musk wants to go to Mars. The money TESLA customers are paying for their cars, and the money investors, big and small, are paying for TESLA's stock, add to the pot of money Musk has to get to his destination. If that's their destination as well, it's their money too. That's the best resolution I can offer.



Destination Mars

At the end of the book, Smilla's Sense of Snow, as Smilla pursues Tørk across the ice on a cold, dark night, she says to herself: "Tell us, they'll say to me. So we will understand and be able to resolve things. They'll be mistaken. It's only the things you don't understand that you can resolve. There will be no resolution."

About Michael L. Sena

Michael Sena, through his writing, speaking and client work, attempts to bring clarity to an often opaque world of highly automated and connected vehicles. 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.

Michael L. Sena

Editor

SUNDBYVÄGEN 38

SE-64551 STRÄNGNÄS

SWEDEN

PHONE: +46 733 961 341

E-MAIL: ml.sena@mlscab.se

www.michaellsena.com