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**4TH ANNUAL PRINCETON
SMARTDRIVINGCAR SUMMIT
17 DECEMBER 2020 – 15 APRIL 2021**

This year's summit was originally scheduled to be held in May. It is now be a virtual event spread over a number of weeks. See the program and register at:

<https://orfe.princeton.edu/conferences/sdc/>

*The focus of the **4th Annual Princeton SmartDriving-Car Summit** will address the challenges of commercialization and the delivery of tangible value to communities. Conference organizer Professor Alain L. Kornhauser says: "We've made enormous progress with the technology. We're doing the investment, however this investment delivers value only if is commercialized, made available and used by consumers in large numbers to deliver value that is commensurate with the magnitude of the investment made to-date."*



and



UNECE

**The SYMPOSIUM ON THE
FUTURE NETWORKED CAR 2021
A VIRTUAL EVENT - 22-25 MARCH 2021.**

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

*With the 2021 Motor Show cancelled, FNC and UNECE have decided that the **FNC 2021 Symposium** will be totally virtual. It will be held on four successive days in March, each day consisting of three-hour sessions dedicated to one of four important topics. The complete program is now ready. See 20 program at: <https://www.itu.int/en/fnc/2021/Pages/default.aspx>*

THE DISPATCHER

Telematics Industry Insights by Michael L. Sena
March 2021 – Volume 8, Issue 5

Vehicle Testing: There is no way to test a car virtually

1. I say ‘might’ because the terms that the companies had to accept in order to gain the right to build factories were designed to transfer the intellectual property of the western countries to China. The advantage of building in China was to avoid the egregiously high import taxes.

2. A region is defined here as one of the major countries/regions in the world: the United States of America, the People’s Republic of China and the European Union. The other countries of North America, Asia and Europe along with South America, Africa and the Pacific countries are part of one of the three markets depending on how closely their normative principles and market dynamics are to one of the three.



CARS ARE NOT clothes, and connected cars are even less so. The idea of outsourcing vehicle assembly and parts production to low-labor-cost countries like China as if they were baseball caps or jeans might have been justifiable twenty years ago when the cars were going to be sold there or in the Asia region.¹ However, for companies with their principal engineering functions and major markets in Europe and the United States, to set up manufacturing in Asia for cars that will be exported to Europe and the U.S. may bring short-term economies of scale in production, but will end up creating a wealth of problems. The same is true for building a car in the U.S. or Europe and exporting it to China. The reason is **connectivity**.

In this article I will discuss why it is preferable from the connectivity standpoint to assemble a car in the region² where it will be sold, why it is essential that the car be driven to every part of the region and thoroughly tested before it is delivered to customers, and why the pandemic has made thorough testing anywhere nearly impossible.

There were already two major challenges with building highly connected cars in one place and shipping them to other markets before the COVID-19 pandemic hit in early 2020: the regionality of mobile network infrastructure and the governmental approach to data privacy. I discussed the data privacy issue in the lead article to the September 2018 issue of [THE DISPATCHER](#). The three regions, the U.S., EU and China, have distinctly different approaches to data privacy and principles of ownership of data, with the individual being the owner of his data in Europe, business having a claim to ownership in the U.S. and the state controlling all data in China.

A third problem that was present but not totally appreciated or understood by most vehicle OEMs was the absolute necessity of thoroughly testing the connected systems and services to ensure that they were working in all corners of the region where the cars would be sold. The pandemic exacerbated the testing problem to the point of

making it nearly impossible to carry out tests. Let's look at why these problems exist and what might be done to solve them.

OEMs are still learning that that today's cars are not your father's Oldsmobile

Vehicle connectivity is not something that is tacked onto a car, like a battery-operated portable TOMTOM or GARMIN navigation system. It's not a smartphone sitting in a hands-free holder. Jacques Nasser 'got that' at FORD twenty years ago, and he got fired for it. From being in a leadership position at the end of the 1990s, FORD has spent the last twenty years trying to make connectivity work with a Bluetooth smartphone. On a scale of one-to-ten, Ford is around a two. The majority of European and Japanese car companies hover just about the five mark. The standouts are GM, BMW and VOLVO.

Vehicle connectivity is a combination of systems that are embedded in the vehicle and services that are connected to those systems. It is based on two-way communication over a wireless network using either an open Internet for services that connect to systems that are totally blocked off from vehicle functions, or a secure point-to-point connection that requires encrypted protocol and security certificates. Some services, like SOS or roadside assistance, require voice and data while others, such as remote diagnostics or software updates, are data-only.

Connected vehicle systems must be built into the design of the vehicle because those systems must be integrated into the vehicle's electronics control network (bus) and connected to many of the vehicle's sensors and electronic control units (ECUs).³

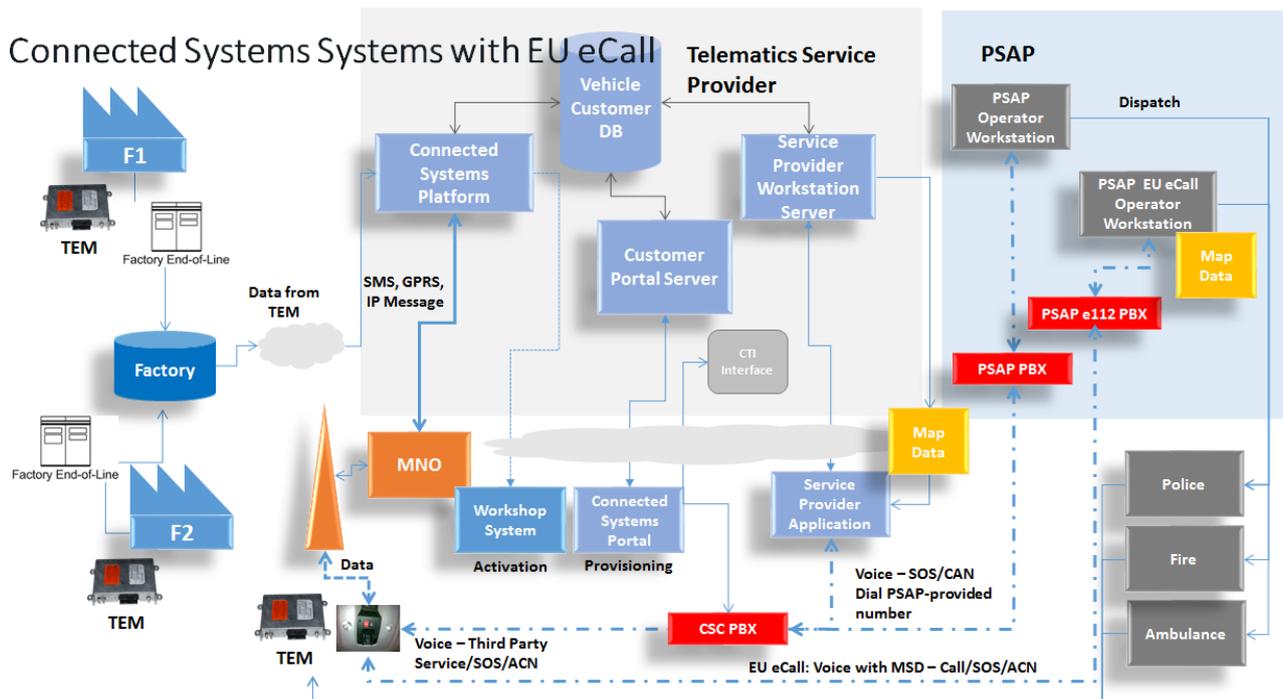
Connected vehicle services must be built into the company's strategy and—this is the important part—they must be tailored to both the customers and the regulations of the markets in which the vehicles will be sold. Each regional market (e.g., Europe, North America, Latin America, Asia) has unique prerequisites, and each country or state within those regions have even more specific constraints.

The diagram below shows a basic embedded telematics system that can be used for automatic and manual crash notification, roadside assistance, theft notification, stolen vehicle tracking, remote door and vehicle control services, among others. The communications module, often referred to as a telematics control unit or TCU, consists of the phone modem and the SIM-card or SIM-chip. The SIM is provided by a mobile network operator



3. There are post-factory-fit devices, like those for theft notification and stolen vehicle tracking or for usage-based insurance, but these can operate in autonomous mode with no connections to the vehicle's systems or a need to be integrated in the OEM's connectivity strategy.

(MNO) who is responsible for ensuring that the phone is able to communicate with both data and voice in all of the markets where it is intended to be used. The SIM is placed in the TCU by the manufacturer of the TCU unit. The TCU is delivered to the factory where the car is being produced and placed in the vehicle. The vehicle is shipped to the market region where it will be sold, delivered to a dealer and eventually sold and handed over to a customer.



TCU units are like any other computer: they don't know what to do until you provide them with instructions. They need to know where to send data in different situations. There might be different destination points for different services. They need to know where to direct a phone call, also according to what specific service is required or where the vehicle containing the TCU is located when the service is requested. The TCU might call one number if it is in the vehicle's home country (i.e., where it is registered) or another if it has travelled to another country. If a car is within the EU, it has the possibility of using the 112 eCall option, but this possibility does not exist in most other parts of the world.

By directing all data messages to a so-called 'telematics service provider (TSP)' as in the diagram, it is possible to simplify message processing, placing the logic for where the data needs to be sent in a central, secure location rather than having to maintain a list of contact points on-board the vehicle.

Services, such as roadside assistance or service bookings, are often subject to certain restrictions. These include whether the vehicle is still under a new car warranty or whether a customer has paid for a subscription (See *Musings* in this issue). Therefore, service delivery is dependent on having access to a customer's records, and these records are maintained in various locations, depending on the OEM's individual IT systems. It has not been that long since OEMs began to centralize global customer records. Until fairly recently, customer records were held either by national sales companies or the dealers where cars were sold.

We don't yet live in a borderless world

All of the OEM had false starts with their connected systems and services programs. VW and Renault started and stopped their first programs within a few years, never getting beyond their home country (i.e., Germany and France). GM, BMW and Mercedes-Benz had systems that were continent-specific for a dozen years or so. Volvo developed a system in the late 1990s for the U.S. without a TSP that it closed down after five years, and it took Volvo ten more years before it returned to the market with the system that had already been deployed across Europe, including Russia. Gradually, all of the OEMs decided it was a waste of time and money to build different solutions for the different markets. They arrived at a basic design that they applied in all markets, with an on-board telematics unit and centralized data messaging. Nevertheless, even though an OEM's system looks similar for all markets, it is are not identical.

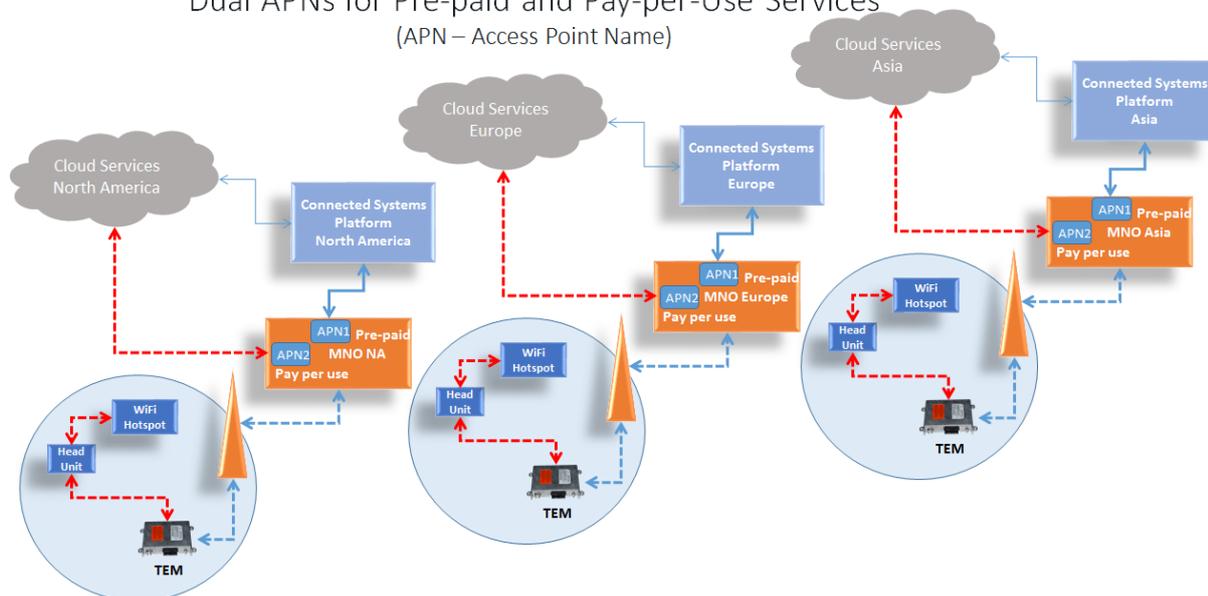
One component that is not the same is the SIM. It makes no sense to try to use an AT&T or T-Mobile U.S. SIM in Europe or China, or to put a China Unicom SIM in a TCU that will be exported to Europe or North America. Anyone who says it will work has never tried to do it. Even though to my knowledge at least one car company has done it, and would never admit that it was a mistake (it is a company whose leader never admits to mistakes), it is costing them a bundle of money, which for many years it did not have. Even mobile network operators that claim to have a solution which crosses borders in the region in which they operate (e.g., the U.S., Canada and Mexico) have trouble with roaming agreements and legacy hardware and software belonging to companies they acquired or have cooperation agreements with. To understand why this is the case, one has to go back to the pre-mobile network days when companies like AT&T, DEUTSCHE BUNDESPOST, Sweden's TELEVERKET and Britain's GENERAL POST OFFICE

were privatized and broken up and new telephone companies were formed. It's a long story and the upshot is that if you move from Sweden to Japan you would be well advised to get yourself a phone with a Japanese SIM contract.

If you have had a mobile phone for more than ten years and you travelled in the U.S. and Canada or across the European continent or into Japan, South Korea and China, you know your phone worked sometimes and not at other times. Phones now work in most places, but you don't always get the same low rates for voice or data that you have in your home market. If you are placing the SIM in a vehicle and signing a contract for the use of that SIM for the life of the vehicle (which is the way an OEM wants to do it, just like for any other component it buys), you want to have the lowest possible price. If you are the MNO, you can't give a low price if you cannot control the roaming costs.

On top of these factors is the issue of latency. It is possible to serve North America from a TSP in Europe or vice versa, but it can add several milliseconds for every trip across and back, creating irritating delays and possibilities for crashing messages.

Dual APNs for Pre-paid and Pay-per-Use Services
(APN – Access Point Name)



An OEM can cover all three major automobile markets with connected services with three regional service centers, one each for the regions, as shown in the diagram above. A fourth will be need for Japan, South Korea and countries in the Pacific, and additional ones for South America and Africa. There might be one cloud services provider for everywhere outside of China. Although the U.S. does not have a General Data Protection Regulation that safeguards private data as in the EU, or a government like the one

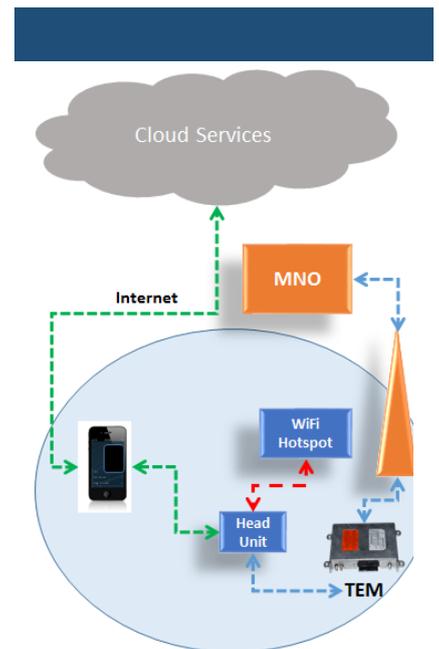
in China that prohibits the flow of data beyond its borders and controls all Internet usage, it is highly possible that the privacy laws that have come into effect in California will spread to other states and require more secure data handling than is required today.

The TCU units will have region-specific SIMs (e.g., AT&T in North America, Telenor in Europe and China Unicom in China) and systems for managing the SIM subscriptions. The diagram also shows a region-specific business solution to the problem of offering services that the OEM pays for, at least during an agreed period of time (e.g., during the warranty period) and those services that are optional and should be paid for by the customer, such as streaming music. Multiple APNs is a relatively new option offered by the MNOs which allows a single SIM to be used for both pre-paid and pay-per-use services. It is a more convenient and dependable solution to this problem than the mobile phone solution used by the majority of OEMs today (shown right), or the dual-SIM solution that was used by Volvo Cars for many years.

When you have finished testing and testing, test again

Why is it so important to test the vehicle connectivity systems and services? They are all based on the same phone modems and SIMs used in smartphones, aren't they? The services are basically the same that are offered with a phone call, right? It is correct that telephone manufacturers have to certify that their phones work before the MNOs will sell them. They have to show that they work with the MNOs' SIMs and their network infrastructures. These infrastructures were built with equipment and software from multiple vendors, such as Ericsson and Nokia, who have also had to adhere to international standards. Yes, a TCU unit in a car can be compared to a mobile phone, one that has a modem for making the voice and data connections, an antenna, a SIM and connections to a display, microphone and sound receiver along with software that controls all of these components. However, when all the parts come together in a TCU made by a TCU manufacturer for a specific OEM, the resulting device is different from any other telecommunications device and it should be tested in the same rigorous way that a handset from Apple or Samsung is tested.

What are you testing? For voice, you are confirming that the phone numbers that have been provisioned on the vehicle are ringing where they should ring. If you have a central call center, like BMW, Mercedes-Benz and VW have in Europe, you need to



The mobile phone solution to separating pre-paid and pay-per-use services.

make sure that the the calls go through from every country. If you have country-specific call centers where the vehicle phones the center in the country in which it is located, you need to ensure that the TCU's software for identifying the country is working and determine what happens when the car travels from one country to another. Does it hang onto the network in the country for an extended period of time, or does it pick up the new network quickly?

For data, you need to make sure that the acknowledgments are properly timed so that the TCU does not start to send a repeat message if the ACK is delayed. Timings vary among countries depending on the network hardware and software installed in the country. Everything could work fine in one country but fail in another. In my experience introducing telematics systems and services in all EU countries, Norway, Switzerland, Russia, China, the U.S. and Canada, every country presented a new set of challenges that had to be addressed by modifying the software in the TCU.

Skimping on thoroughly testing connectivity systems and services is the biggest mistake that an OEM can make, and most of them do it. I believe the reason has been that no one except the customer was holding the car project teams accountable for the performance of the systems and services. There was no component type approval for a telematics control unit. As of April 2018, there is a type approval test within the EU for EU eCall, but it is only for the hardware. There is no requirement to physically test it in every country where the EU eCall regulation applies. This situation is going to be changing to a certain extent with the UN R155 and UN R156 regulations on cybersecurity and software updates, at least in Europe and other countries that employ the type approval process (e.g. Japan and South Korea). However, it still does not mean that OEMs will be obligated to drive their cars in all countries or through all states.

It is the car project teams that prepare the budgets for testing, and these budgets have to be approved by the purchasing departments that manage the purse strings for a car project. All the numbers have to add up, and buying cars for testing at every stage in a project (tooling tryout, pilot production, mass production) is a cost that has to be matched with corresponding income from sales. The question that is asked by the money counters is: "What is the minimum testing you can do to make sure the basic system works so that we don't have to make costly

repairs or have a recall? Can you make do with one car?" You might be able to do it with a single car if you have six months to drive it everywhere in Europe and another six months to drive in everywhere in North America. That is not a practical option, and you still would not have covered Hawaii, Alaska or Iceland.

Testing when there is an on-going pandemic

"Don't even think about doing this again." That's what the border guards said to the test team travelling back to Sweden after a quick tour into Denmark in January 2021 to test their TCU's software. Denmark closed its borders to all international traffic on March 13th 2020. That included Sweden. The closure lasted for five months. It appeared COVID-19 was under control in both Sweden and Denmark during the summer, then the second wave hit both countries. Denmark was more affected by the new variant that developed in the UK, which was determined to be more easily spread. Sweden closed its border to Denmark in December. If you are building cars in Sweden, you have three routes to the rest of the European continent: the Öresund Bridge; ferries to Denmark, Germany, Finland or Poland; or a drive through the very north of Sweden into Finland. All those routes were closed or open only with quarantine restrictions beginning in March 2020.⁴

Any car that has been introduced in Europe during the second half of 2020, or is planned to be introduced in 2021, will have to deal with these restrictions. Long expeditions across borders is not going to be possible. The only alternative to halting introductions altogether until travel restrictions are removed is to delay sales and deliveries until cars that are shipped to each country for either sales through dealers or deliveries to customers who have ordered them are tested. Test teams should accompany cars that are transported on trucks to each country. When the cars are off-loaded, they should be driven throughout the country where they will be sold. Any problems encountered with connectivity should be reported and evaluated for severity. Either the problems should be corrected or the problems mitigated before sales or deliveries commence. This should be done in each country.

Simulations, bench testing with rigs and driving around the plant are all good ways to get the basics working with vehicle connectivity systems, but none of these methods are a substitute for putting a car's telecommunications systems through their paces where they will be used, not on the other side of the world.



Only Danish citizens and residents were able to cross the iconic Öresund Bridge from Sweden beginning on March 13th for a period of five months. It was supposed to be only one month, but it was extended because Denmark felt the virus was spreading too fast in its neighboring country. In December, Sweden returned the favor and closed all border crossing from Denmark.

4. On February 12th 2021, the worsening situation in the Austrian province of Tyrol and the Czech Republic forced Germany to announce new border controls with both countries to contain the spread of the disease. German Health Minister Jens Spahn said the new rules, which will come into effect on February 14th, were "unavoidable."

"To protect the population from virus mutations -- this is why the federal government decided yesterday to declare the Czech Republic, Tyrol and Slovakia as coronavirus variant areas," Spahn said at a news conference Friday.

*Reported in CNN World News
14 February 2021*



5. GEELY and tech company BAIDU have entered into a partnership to start a new company to build connected, autonomous electric vehicles. The vehicles will be based on GEELY's electric Sustainable Experience Architecture (SEA) with BAIDU technology onboard and will offer a maximum of about 435 miles of range. The partnership will result in a new company although its name is unknown and there's no word on when the first vehicle will be announced.

6. SPACs are shell companies that raise funds in an initial public offering with the aim of buying a private company, emerged last year as one of the most popular investment vehicles on Wall Street. For the company being acquired, the merger is an alternative way to go public over a traditional IPO.

Electric Vehicle News

Is there no end to Geely's partnerships

ADD FARADAY FUTURE to the growing list. Last month I wrote about GEELY teaming up with FOXCONN. It already has positions in DAIMLER, AB VOLVO and owns all or most of VOLVO CARS, LOTUS, LYNK & CO, POLESTAR, GEELY AUTO, PROTON and LONDON TAXI. It owns 50% of SMART AUTOMOBILE with DAIMLER holding the other half. A year ago, GEELY AUTOMOBILE HOLDINGS, which sits over GEELY AUTO, LOTUS, PROTON and a 70% share of LYNK & CO, made a strategic agreement with TENCENT HOLDINGS to "develop digital capabilities and smart car technologies." In January of this year BAIDU and GEELY made a joint announcement of cooperation.⁵ Now, California-based electric carmaker FARADAY FUTURE was given a major cash injection from a GEELY and a group of Chinese state-owned companies.

I wrote about FARADAY FUTURE in the [January 2016](#) issue of *THE DISPATCHER* (see page 5). *"Its management team is made up of four former Tesla executives and one from BMW. It is developing an all-electric sports car. It is playing the same game as Tesla to get US states to compete to have its factory located in their state (Tesla did it with their battery factory). And they have a name that links the company to the dawn of electric motors. In 1831, Michael Faraday started work that led to his discovery of electromagnetic induction. Still, FF management do not like to be compared to Tesla. They will do something completely different, they say."*

FARADAY FUTURE was founded by Jia Yueting, a Chinese businessman who made a bundle of money but seems to have lost his life's narrative. He filed for personal bankruptcy in 2019 and stepped down as chief executive of FARADAY. He was replaced as CEO by Carsten Breitfeld, who had been pushed out of BRYTON. In January of this year, FARADAY FUTURE announced that the company was going to do a 'reverse merger' with a SPAC⁶ (special purpose acquisition company), with an estimated value of \$3.4 billion. GEELY will be an anchor investor in a \$775 million financing package for the deal in the form of private investment in public

equity (PIPE). A few dozen institutional investors from China, the U.S. and Europe are investing \$1bn in the carmaker.

Where does GEELY come in? FARADAY FUTURE says it plans to set up a new base in China, adding to its plant in Hanford, California. Earlier this month, GEELY formed a partnership with BAIDU to build electric vehicles for the Chinese online search giant. It set up a joint venture with FOXCONN TECHNOLOGY GROUP, and the two stated that they intended to build cars for other brands. This fits right into that plan, according to an article in the *SOUTH CHINA MORNING POST* (28 January 2021).

This deal is interesting from a Sino/American political angle. If the IPO is completed, Jia Yueting stands to make a pile of money. He is still a major investor. That would help to clear up his debts in China and allow him to return to the business scene back home. As it looks now, the company would be taking the money and moving operations to China, having had the battery pack, motors, and inverter all designed by a group of engineers that created the *GENERAL MOTORS EV-1*, the first attempted mass-market electric car. *"FARADAY FUTURE was one of the first EV companies to design one of these modular so-called "skateboard" platforms, where all the tech that's crucial to powering an EV is integrated into the base of the car and can fit differently sized vehicles. It's just never had the chance to execute on the idea."*⁷ How the new Biden administration handles this will be interesting to see.

Chinese Ford Mustang Mach-E SUV

COOL TESLA-ESQUE. That is how the new FORD model that will be built in China was described by the editors of *TESLARATI*. This is a group that describes itself as *"a California-based (where else?) multi-platform media company and leading lifestyle brand with a focus on Tesla, SpaceX, and ventures affiliated with Elon Musk."* I agree with *TESLARATI*, it does look 'Tesla-esque', particularly Model X-esque, especially compared to a real Mustang like the 1968 *Ford Mustang Shelby GT350* pictured below the humpty-dumpty version to the right.

Why is FORD building the new model in China? Just to be clear, China is not the only place where the Mach-E will be built. Ford's plant in Cuautitlan, Mexico is the other manufacturing location, and deliveries of the car from there have already started. As of February 2021, 10,000 of them had been produced and 5,000 were sent to U.S. showrooms and the rest around the world. Apparently, the first batch was sent to Norway. Yes, Norway!



FARADAY FUTURE first announced plans in 2017 to build the FF 91, pictured above. It is a fully electric vehicle that was planned for launch in 2019, but it seems the company did not have a business plan. It is not clear what has changed on that score, or whether the car that will be built is the one showed four years ago. That one had a price tag of \$200,000.

7. [HTTPS://WWW.THEVERGE.COM/TLDR/2021/1/19/22229493/FARADAY-FUTURE-SPAC-MERGER-PSAC-PUBLIC-IPO-STOCK](https://www.theverge.com/tldr/2021/1/19/22229493/faraday-future-spac-merger-psac-public-ipo-stock)



So, why China? Production of the Mustang Mach-E is being handled by the FORD's Changan Ford joint venture. Although the major handouts by the China government for electric cars have been reduced, there are still enough incentives to make buying electric worthwhile. A total of 1.34 million electrified vehicles were sold in China last year, up 12% from 2019. By comparison, only 328,000 were sold in the U.S., up 4% over the previous year. So, if you follow the impeccable logic of the notorious bank hold-up artist, Willie Sutton, who answered a judge's question: "Why do you keep robbing banks?" with the obvious answer: "Because that's where the money is", Ford is simply going to where the money is.

There's a new political climate on the climate in DC

THE PROBLEM BETWEEN the State of California and the U.S. Federal Government started for the same reason that most problems in the world started during the period between the 19th of January 2017 and the 20th January 2021. The PotUS during that period (now the ex-PotUS, or as President Biden refers to him, the 'former guy') picked a fight with everyone over everything. In this case, it was over California's decision to defend its authority to issue its own vehicle emissions regulations in accordance with Section 209(b) of the Clean Air Act passed by Congress in 1970 stating that the federal *Environmental Protection Administration* must grant a waiver of preemption to California to allow the state to issue its own vehicle emissions regulations if certain statutory conditions are met. California's regulations have most often been more advanced (meaning more strict) than the corresponding federal program, and the state has functioned as a sort of laboratory or test bed for innovation.

California, the EPA and the Department of Transportation's National Highway Traffic Safety Administration (NHTSA), which is the body responsible for rulemaking regarding emissions, were getting along just fine for almost fifty years until 2018 when NHTSA, following the ex-PotUS's orders, decided that the emissions requirements set by President Obama's administration were too strict. The previous administration called for a tightening of 5% each year on vehicle fuel efficiency. Post-Obama NHTSA set a 1.5% reduction. California decided to meet the government half way with a proposed 3.7% increase in annual fuel efficiency. Elaine Chao, following the ex-PotUS's orders, refused to budge on 1.5% and on the 27th of September 2019, NHTSA finalized the rulemaking, purporting to terminate California's historic right to set its own vehicle emissions standards pursuant to waivers EPA grants under the

CAA. NHTSA concluded that the EPCA (Energy Policy and Conservation Act), enacted in 1975 in response to the 1973 oil crisis, preempts any state or local regulation limiting or prohibiting tailpipe GHG (greenhouse gas) emissions from automobiles (the “Preemption Regulation”). Under this Act, NHTSA was given the authority to regulate fuel economies for automobiles and light trucks, setting their Corporate Average Fuel Economy (CAFE), but, with one minor exception in 2009, it had never used it to prohibit California for setting its own regulations.

What’s a state to do when it feels it has lost its CAA-given right? It sued, and it brought in others to add support.⁸ These included twenty-two other states and the NATIONAL COALITION FOR ADVANCED TRANSPORTATION. Together they were the ‘Plaintiffs’. The named ‘Defendant’ was Elain Chao. The COALITION FOR SUSTAINABLE AUTOMOTIVE REGULATION came in as a ‘Defendant-Intervenor’. CSAR is a group of automobile manufacturers and dealer groups, including STELLANTIS, HYUNDAI, KIA, MAZDA, MITSUBISHI, SUBARU, TOYOTA and the NATIONAL AUTOMOBILE DEALERS ASSOCIATION. GENERAL MOTORS was a founding member, and was originally part of the lawsuit filed against California. CSAR claimed it was supporting DOT/NHTSA in order to “return to one single regulatory program for sustainable automotive industry regulation”.

What about the other automakers? FORD, BMW, VOLKSWAGEN, VOLVO CARS and HONDA finalized binding agreements with California in August to meet stricter fuel economy and emissions standards through the 2026 model year than ones set by the post-Obama administration.

Following the election of Joe Biden, GENERAL MOTORS in November decided to back out of their Defendant-Intervenor role and withdrew from the suit. *“We believe the ambitious electrification goals of the President-elect, California, and General Motors are aligned, to address climate change by drastically reducing automobile emissions,”* GM’s CEO Mary Barra said in the letter. (Hedging her bets just in case Joe Biden didn’t win, she waited until after the election.) Also in November, FORD urged the CSAR automakers to join the framework agreement it and others had made with California. On the day of his inauguration, President Joe Biden issued an executive order directing the Department of Transportation and the EPA to reconsider the former administration’s 2019 decision to revoke California’s authority to restrict tailpipe emissions. The order gave DOT and EPA until April 2021 to review the



8. http://blogs2.law.columbia.edu/climate-change-litigation/wp-content/uploads/sites/16/case-documents/2019/20191115_docket-119-cv-02826_motion-to-intervene-1.pdf

decision and until July 2021 to review fuel-efficiency standards for light vehicles.

CSAR saw which way the winds were blowing. On the 2nd of February, it decided to withdraw from the lawsuit, issuing the following statement: *"We are aligned with the Biden Administration's goals to achieve year-over-year improvements in fuel economy standards that provide meaningful climate and national energy security benefits, reduce [greenhouse gas] emissions and promote advanced technologies. In a gesture of good faith and to find a constructive path forward, the CSAR has decided to withdraw from this lawsuit in order to unify the auto industry behind a single national program, with ambitious, achievable standards."*

In a not-so-good-will response, California Governor Gavin Newsom thanked the automakers in the CSAR for "dropping your climate-denying, air-polluting, (ex-PotUS)-era lawsuit against California" and urged them to join the voluntary framework. And following the old adage, 'Give 'em an inch, and they'll take a mile', fifteen states with California and New York in the lead have sued NHTSA over the previous administrations decision to agree to a request from the auto industry to delay the start of dramatically higher penalties for companies that fail to meet fuel efficiency requirements.

The automakers had argued that the requirements were unrealistic. The fines had been set during the Obama administration, raising them from \$5.50 to \$14.00 for every 0.1 mile per gallon a new vehicle consumes in excess of the requirement. President Biden has ordered a review of the decision to roll back vehicle emission requirements.

VW goes it alone on its driverless software

WHILE OTHER OEMs look for partners to help them develop their vehicle software in places like Silicon Valley in California, Squirrel Hill in Pittsburgh and Kendall Square in Cambridge, VW feels comfortable with its home grown team of research scientists who are based in Ingolstadt, Germany, the headquarters of VW's subsidiary Audi. The unit responsible for software development is called **Car.Software.Org**.⁹ It currently has a staff of around 5,000 and is responsible for developing the VW.OS operating system for all VW Group models, an automotive data cloud and a new electron-



9. With all the convoluted and weirdly-spelled names for companies these days, it's refreshing to see a name that is straightforward and says what the company does. We're an organization that makes software for cars, says the name.

ics architecture. The new CEO of *Car.Software.Org* is Dirk Hilgenberg, who was Senior Vice President Production System, Technical Planning, Tool Shop, Plant Construction at the BMW Group before joining VW in 2020.

"We have a size that makes us want to cooperate with ourselves initially," says Markus Duesmann, who is the CEO of Audi and the VW Board of Management member responsible for research and development for the entire VW Group, under which Car.Software.Org sits. "We are now starting the biggest revolution in the automotive industry. In a few years, a car's operating system and its connectivity with a highly secure data cloud will make all the difference. This is why the strong positioning of Car.Software.Org as a cross-brand unit for software development at the Volkswagen Group is a key step into the future. The close cooperation with all brands and teams will be decisive for the success of the Car.Software organization. With my team at Audi, we are assuming a special responsibility as a premium brand. Because for many of our customers, premium is already defined today primarily through digital technologies that are perfectly tailored to their users. Our aim is for all brands in the Volkswagen Group to benefit from this pioneering role."

CSO did bring in some reinforcements to bolster its in-house staff. VW's majority share of WIRELESSCAR is owned by *Car.Software.Org* and WIRELESSCAR delivers services to CSO. Dirk Hilgenberg is the chairman of WIRELESSCAR's board of directors. WIRELESSCAR remains an independent company and is not integrated into CSO's organization.



Driving Neat: Can U.S. Take Its Cars Without ICE?

Elon takes his whiskey with ice
but his cars neat



In 2018, Elon Musk made a joke on Twitter about “Teslaquila,” and even went as far as to file a patent for it. In 2019, during a REDDIT Q&A, Musk wrote that whiskey was his alcohol of choice, which was no surprise to anyone who saw him on Joe Rogan’s podcast last year where he drank whiskey. Look closely and you will see ice in the glass.

10. By 2025, VOLVO CARS, the Swedish/Chinese carmaker, expects 50% of its sales will be PHEVs, and the other half will be BEVs. According to CEO Håkan Samuelsson, the premium car market will go all-electric very soon, and Volvo intends to lead that shift. Jaguar has said it will only make electric cars after 2025.

11. The Super Bowl is an annual championship game played by two professional American football (i.e., not soccer) teams that have won their respective divisional championships. For those who are totally uninterested in the game, it offers a spectacular musical extravaganza in between the two halves of play, and usually provides highly entertaining advertisements that companies pay extravagant sums of money to be able to show. To maximize the number of ads and thereby the amount of money taken in by the TV network hosting the Super Bowl, there are an irritatingly large number of unnecessary pauses in the game.

Europe and U.S. following different paths

NO SCOT WORTH his malt would think about plopping an ice cube into his national drink. He takes his scotch neat, with a few drops—max—of mountain-pure H₂O to ease out the flavour. NO ICE. On the other side of the pond separating the European and North American continents, the Scot’s American cousin relishes the jingling sound of bourbon on the rocks. Will the rejection and acceptance on the two continents of ice in whiskey repeat itself when it comes to wanting ICE in cars, with Europe doing the rejecting and America sticking with internal combustion engines? Let’s look at what is going on in these two markets that, until 2013, were the largest markets for car sales on the Planet, cars that were by definition ICE vehicles.

It feels like it started less than a year ago, the unanimity among automotive CEOs that their companies would be abandoning ICE vehicles in the not-too-distant future in favor of primarily battery electric vehicles. Some of them put end dates on the transitions.¹⁰ A few of them have been talking about it for more than a year, and we have taken what they’ve said with a rather large grain of salt. Lately, that grain has grown smaller. I listened to a radio program on a Sunday afternoon in late January while my wife and I were driving in our medium-sized, petrol-fuelled SUV through the middle of Sweden. During the forty-five-minute program, various experts opined that the inflection point in the acceptance curve had been reached and it was now inexorably heading upward. Nothing could stop it. All their compass arrows pointed toward Norway.

What’s the story with Norway?

GENERAL MOTORS decided to make Norway’s electric car story known to Americans by using it as the centerpiece of its Super Bowl advertisements.¹¹ Norway is one of those countries having fewer than ten million inhabitants that mostly minds its own business and does its best to stay out of the news. It wins lots of medals during the Winter Olympics and hands out the *Nobel Peace Prize* in Oslo, its capital, while the rest of the Nobel Prizes are given to their recipients in Sweden’s capital, Stockholm by the Swedish

King. A fact about Norway that is little-known outside of Europe is that it is very rich as a result of finding oil in its North Sea territorial waters in the 1970s. Its nominal GDP per capita is fourth in the world, according to the IMF. The Norwegian government decided that in order for its citizens to enter heaven, it would have to atone for its sin of having fueled the world's cars with its liquid gold and contributed to global warming. The government—which is, of course, elected and governs at the will of its citizens—decided that one way to do this was to make it nearly impossible for its citizens to buy and own cars. When that didn't work, it came up with the idea that it would force those who really wanted to buy a car to purchase a battery electric vehicle or plug-in hybrid. Last year (2020), the number of BEVs sold in Norway exceeded the number of ICE passenger vehicles sold (54% versus 46% of a total of 141,412), and this was the first time this happened anywhere.¹² This is why GM is making Norway a poster child in its ad campaign.

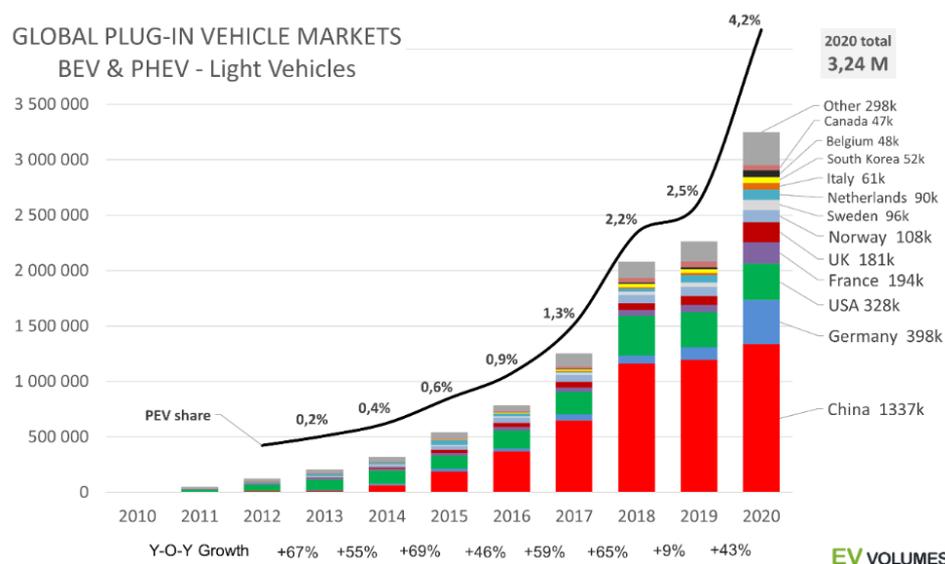


12. A total of 173,522 passenger and light commercial vehicles were sold in Norway in 2020, of which 108,000 were BEVs and PHEVs.

Before we all get swept away, it is good to keep in mind that passenger car and LCV sales in Norway are 1.2% of the number in the U.S. with 1.7% of the U.S. population.

Is GM getting ahead of itself in the US?

How many electric cars are being sold in the US? As the graph below shows, there were 328,000 BEVs and PHEVs sold in 2020. China sold lots more. Germany sold 20% more electric vehicles than the U.S. and did it with a population that is 26% of the population of the U.S. France sold three times more per capita than the U.S. What is clear from the graph below is that the actual



volume of electric car sales in the U.S. is not growing that quickly. The difference between what is happening in the U.S. versus Europe is shown clearly in the graph to the right. Electric vehicle (BEV and PHEV) growth in Europe was 137% in a market that contracted by 20% due to COVID-19. Europe passed China in 2020 as the world's largest electric vehicle market. Light vehicle sales in the U.S. were down 15%, less than in Europe, but growth of electric vehicles was up by a mere 4%. Already in 2019, electric vehicle sales in Europe were almost double those in the U.S.

GM has a steep hill to climb if it plans to wean its buyers off their ICE vehicles, especially because of the vehicles they buy. Of the 2.5 million light vehicles sold by GM in 2020, 587,000 were the Chevrolet Silverado pickups, 271,000 were the Chevy Equinox SUVs and 253,000 were the GMC Sierra pickups. The biggest sellers among its Cadillac and Buick models were SUVs and crossovers. The electric vehicles that sell best globally are shrimps compared to GM's behemoths. TESLA's Model 3 garnered 12% of the 2020 world market. TESLA's Model Y, which is a little SUV, came in 4th with 3% market share. The rest of the top ten are teeny. And they are not inexpensive. Does GM expect its Silverado buyers to squeeze into a car the size of a Renault Zoe or pay the same price as they would for a Nissan Leaf? That's a stretch.

GM and the other OEMs manufacturing and/or selling cars in the U.S. who are saying they will drop the ICE are counting on the same type of government handouts to buyers that exist in Europe and China to lower the price into the affordable range, and they are also counting on governments to start putting their citizens' money into charging stations. Chances of these two things happening increased a thousandfold on November 3rd 2020 when a new President was elected. Nevertheless, it is still true that you can lead a horse to water, but you can't make him drink.

Hybrids still rule the roost

Nearly 5.4 million hybrid electric vehicles (HEVs) and over 1.4 million plug-in electric vehicles (BEVs and PHEVs) have been sold in the U.S. since they came on the market in 1999 and 2010, respectively.¹³ HEVs are powered by a traditional gasoline or diesel internal combustion system (ICE), but still provide lower emissions and higher fuel efficiency due to the combined use with electric motors running on battery power generated by the vehicle when braking and cruising. They have none of the range anxiety or inconvenience of charging.



<https://www.ev-volumes.com/country/total-world-plug-in-vehicle-volumes/>



The diminutive Renault Zoe

13. <https://usafacts.org/articles/how-many-electric-cars-in-united-states/>

TOYOTA, which was the largest global car manufacturer in 2020, still sells mostly non-electric vehicles. Approximately 17% or 1.5 million of the new cars it sells are electric, primarily HEVs. The RAV4 was its 2020 best-selling model globally. It was the number one passenger car (non-pickup) in the U.S. and #4 overall after #3 Ram Pickup, #2 Chevy Silverado and #1 Ford F-Series. The large majority of the U.S. RAV4 sales were ICE vehicles. I asked my TOYOTA dealer about its sales when I was in there this week with my 2014 ICE RAV4 for my 135,000 maintenance, and he said that almost all the cars they are selling are electric, mostly HEVs, including the RAV4.

Damn the torpedoes, full steam ahead

While governments in Europe, reinforced by EU regulations, have been pushing consumers toward electric vehicles, car manufacturers have now decided they are going to have to pull their customers into their electric car offerings. In January of this year, eighteen companies, including GM, FORD, VOLVO GROUP and even UBER and FEDEX, have banded together in a newly-formed organization called the ELECTRIFICATION COALITION BUSINESS COUNCIL. According to a statement by the COUNCIL, its intention is to “create a strategic alliance that can supercharge support for policies and actions needed to accelerate transportation electrification at a mass scale.” GM’s Robert Babik, Executive Director of Global Regulatory Affairs, says he sees the Council “amplifying the benefits of EVs for consumers and society alike, while identifying and advocating for consensus public policies, such as infrastructure support and consumer incentives, that will make an all-electric future possible.”

VOLVO CARS is not a member of the COUNCIL, at least not yet. VOLVO’s CEO, Håkan Samuelsson has a different view, one that he has honed after many years of seeing the effects of pushes and pulls by governments and companies to promote one technology over another. He says: “Forget tax credits and other subsidies: ICE car banning is way more effective than giving people money to buy electric cars.” He says that if we all believe that electric cars are the future of personal transportation, putting a deadline for ICE vehicle sales helps companies plan for EVs accordingly, as well as promoting EV adoption. Samuelsson said incentives do not help in building sustainable and profitable businesses. “When carbon credits and subsidies end, what is left is what will keep these enterprises going,” he says.



Electrification Coalition Business Council – List of Members

- AECOM
- AMPLIFY
- ARRIVAL
- COX AUTOMOTIVE
- EVGO
- FEDEX
- FORD
- GM
- KIA
- LION ELECTRIC
- PARSONS
- PROTERRA
- RHOMBUS
- RIVIAN
- ROUSCH
- SOURCEWELL
- UBER
- VOLVO GROUP

Musings of a Dispatcher: The Button Doesn't Work



*On 6 March 2009 in Geneva, then-U.S. Secretary of State Hillary Clinton presented Russian Foreign Minister Sergey Lavrov with a red button with the English word "reset" and the Roman alphabet transliteration of the Russian Cyrillic alphabet word *перегрузка* ("peregruzka"). It was intended that this would be the Russian word for "reset" but actually was the word for "overload". Additionally, the button switch was the type commonly used as an emergency stop on industrial equipment. Lavrov and Clinton pushed the button simultaneously. Nothing happened then or afterward.*

HOW MANY PEOPLE who actually live in cities, as opposed to those who are just visiting from their rural or suburban domiciles, push one of those buttons on poles at intersections that have text something to the effect: *PUSH TO WALK*? The natives know they don't work. They're a ruse, a subterfuge, perpetrated by the city's traffic department to serve as a palliative for pedestrians who believe they should have unrestricted right-of-way. "I'll push this button and the cars will come to an immediate stop," thinks the bumpkin while the hardened urbanites jaywalk at will.

The world is full of buttons that don't work and we add them at an astounding rate. Remember the RESET button that Secretary of State Hillary Clinton took to her meeting with her Russian counterpart, Sergey Lavrov, who, like his boss seems to have his job for life. This one, pictured to the left, was the perfect metaphor for all buttons that don't work. It wasn't connected to anything.

Buttons in cars that don't work have been a sensitive issue for me since I began working with Volvo On Call in 1996. There was a constant debate about whether a customer should have service when pushing a button if they hadn't paid a subscription fee after the free services during the warranty period expired. I argued that they should, but was usually overruled. That was when car companies still had mostly mechanical and electrical engineers in charge, and the term 'service' referred to what you told your customers they had to do to their car every so many kilometers/miles if they expected them to start and continue running.

Following the financial crisis in 2009, when OEMs had to rebuild their staffs and started hiring people who had worked for IT or telecommunications companies, there was a different opinion being expressed. "A dead button is not what our customers expect when they pay a lot of money to buy one of our cars," exclaimed one former NOKIA employee who was now in charge of the go-to-market strategy for a European luxury car manufacturer. They were late to the telematics market and I was there to help them along. The former NOKIA strategist wasn't a car guy. If he could have ridden everywhere on his smartphone (he

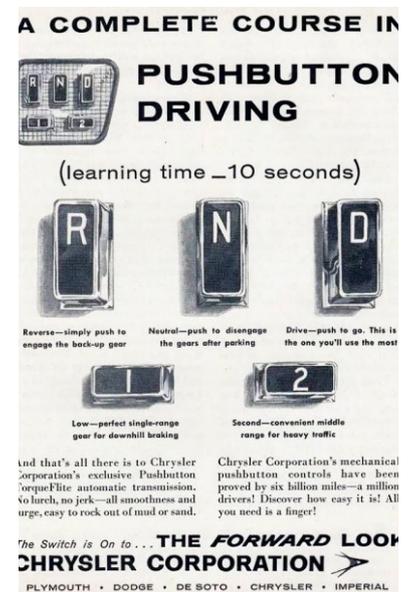
had a *Nokia Lumia* at the time) he would have been perfectly happy doing it. He wasn't long for the car business, and I doubt he even owns a car today. But what he said that day in a meeting of the group in charge of designing the company's new telematics system made a lot of sense and has stuck with me.

Deciding to put a button in a car is like deciding to get married—except it's more permanent

My father bought a used *1963 Dodge Polara* that had a pushbutton automatic transmission. It had two buttons I am sure he never pushed, those for first and second gear. He put it into drive and left it there until the ride was over, then it went into neutral. But maybe the next owner of the car was a motorhead who wanted the extra power or downhill braking control that first gear would offer. He wouldn't be too pleased if nothing happened when he pushed it. My Toyota RAV4 has a few buttons that I don't use. One of them is labelled CAR, and I had never thought about it until I was writing this article. It actually does do something useful, summarizing my fuel usage and average speed. The most important button in the car that I use every time I drive it is the PUSH BUTTON START button, and sometimes it doesn't work. If the Smart Key battery is low or dead, if the vehicle's battery is low or dead, if I accidentally deactivated the Smart Key (when I was cleaning my dashboard, for example), or if I am not pressing the brake pedal hard enough, my car just says 'Hell no, I won't go.'

I have tried to understand the thought processes of those who believe there should be buttons in cars they are designing that work at times and then stop working. Maybe they think it's like those buttons on smartphones that the phone supplier puts there that I have to activate or pay a fee to use. It happens that I catch a glimpse of someone's smartphone and I see it is filled with tiny icons filling the screen. Mine has twelve. I use ten of them. I keep the other two, iTunes Store and App Store, just in case I may need them. So far, I haven't. All the other buttons work, and I use them all almost every day.

Putting a button in a car is not an inexpensive proposition. When we were working on Volvo On Call, I asked for three buttons, one for SOS, one for vehicle assistance and concierge and a third for reaching other third party services. I was told there wasn't enough room on the keypad for a third button and it would be too expensive to add it. I never found out what the extra cost would have been. In 1996, there was no way to calculate the benefit side of



This is the original Volvo On Call button pad, with the OnCall and SOS buttons neatly set into what looks an awful lot like a mobile phone keypad. The slot at the very bottom was for a personal SIM-card which allowed the user to make and receive private phone calls. The embedded SIM was used for reaching the designated third-party services partners.



the equation for that button, especially since the company was taking it completely on faith that the other two would pay for themselves.

It would be pretty difficult for a company to deactivate the SOS button, and unless the modem behind it is retired by the mobile network operator, as happened with the first Volvo On Call systems introduced in the U.S. that were based on TDMA, and the AMPS systems that GM OnStar put on the market starting in 1996, they should still be able to make a phone call.¹⁴ The problem with that other button is that someone needs to get paid for picking up the phone. There needs to be a phone number programmed into the unit that is making the phone call and there needs to be a destination for any data that is sent to help to deliver whatever services are attached to it. In a way, it's similar to having a working connection between the PRESS TO WALK button at the crosswalk and the traffic signals. Some interaction is required between that button and the software that controls the traffic signals based on flow of traffic or based on giving buses or emergency vehicles priority.

Give every button a voice

How about this: Let's agree that there shall be no orphaned buttons in our cars. If an OEM does not want to continue to be the guardian of a button that it once brought into the world, it will give the car owner—no matter if he is first or follower—the right and the ability to put a service provider of his choice behind it. He can choose to send the button signal to his own roadside assistance provider or his stock broker or his bookie or his personal trainer or his psychiatrist or his whatever. The OEM can compete for the heart and mind of the owner by offering its own services to sit or stand at the end of the button push, but it should be up to the owner to decide on the service provider when pushing that button is no longer free. If he decides he doesn't want the button to work, it's HIS CHOICE.¹⁵

Just to make it all fair, I believe that every congressman and congresswoman, and their equivalents in all countries (and, of course, those EU parliamentarians), should donate on an annual basis one hundred units of the currency in which they are paid (e.g., \$, £, €) to a fund to pay the OEMs to insert the YOUR CHOICE button. If they can make laws that cost money, they can pitch in to help to pay those costs.



14. TDMA – Time Division Multiple Access. It allows several users to share the same frequency channel by dividing the signal into different time slots. Principally used in 2G networks.

AMPS – Advanced Mobile Phone System. An analog mobile phone system standard originally developed by Bell Labs and later modified in a cooperative effort between Bell Labs and Motorola.

15. You can substitute 'she' for 'he' and 'her' for 'his' if you are of a mind to do so. It's YOUR CHOICE.

About Michael L. Sena

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

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



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