DVN-I
Automotive Interior

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Editorial

Comfort & Safety

As we progress toward more automated and connected vehicles, new usage scenarios are creating new comfort needs, and in parallel creating new cabin safety challenges.

In this fourth issue of DVN-I, we present an in-depth look at seat comfort, combining ergonomic improvements mostly linked to new development tools and adaptation to various usage scenarios, and expanding comfort to wellbeing within the larger scope including audio, thermal, and other ancillaries.

More technology load within a vehicle creates more distraction potential and more cognitive load on the driver—and that's in addition to old, longstanding issues like the sleepiness that can creep up on a long-distance driver. The optimistic perspective is that AVs will reduce crashes until they're a very unlikely occurrence, but the reality is more nuanced and complex; for one thing, traffic will contain a mix of variously-autonomous and human-driven vehicles for at least half a century! So, in this issue of DVN-I we are focusing on safety needs for this challenging evolutionary period.

Of course, you'll also find variety in the interior news we present; there's coverage of new generation mirrors, HMI at the steering wheel, hologram-controlled audio, and new vehicle interior first-takes. And we've got news about GM's Super Cruise, AV partnerships between automakers and the digital world, automatic shuttles, and more.

Next week we will publish our first full-length DVN-I Report with a complete summary review of the automotive interior shows and conferences from the first half of this year, presenting all trends driving this industry.

DVN-I is now two months old, and the favorable feedback we're getting is just one indication that it has really taken root. Now's a fine time to confirm your interest by taking out a subscription. Just contact us by email or you may find us on LinkedIn.

In the meantime, enjoy reading! We're glad you're here, and we thank you for your support.

Sincerely yours,

Philippe Aumont
General Editor, DVN-Interior

In Depth Automotive Interior

Is Comfort Still Mobility's Holy Grail?

Connected, autonomous, and shared vehicles are concentrating on new mobility usage scenarios, with more effort than ever being put into occupant experience before, during, and after transportation. Seat comfort is a key dimension of this experience, and recent news and conferences showed a lot of focus on the topic.

Although the shapes of car seats are more or less one-size-fits-all, over the year manufacturers have created numerous ways to customize how seats are positioned in efforts to adapt to the multiple sizes and preferences of drivers. Whereas old vehicles only had the options of reclining and sliding forward or backward, today's cars have seats that move up, down, forward, backward, and just about any other direction, and change shape with adjustable lumbar support and otherwise like that.

WCX™, that is SAE's World Congress Experience in early April in Detroit, is a key American event for the whole community of the mobility-engineering field. Among many topics, from IoT, big data, and connectivity to automated and unmanned vehicles, and from safety, blockchain, and powertrain to sustainability and cybersecurity, WCX 2019 included an interesting technical session on seat comfort.

As in any field of technology, scrutiny of the past can provide insight into the future. A contribution presented the history of human factors in seating comfort with 148 unique contributions (131 publications) over 20 years. Those are big numbers, reflecting high interest driven by evolving technology, customer wants and needs, and science.
The list of contributors, in terms of authors and their affiliations, is also telling; it shows strategic shifts toward collaboration between automakers and tier-1 and -2 suppliers as well as academia and

the startup ecosystem.

These references, representing the foundation of automotive seating comfort, cover topics including:

- Behavior of a seated human body gets the positive Influence of active suspension system, compared to passive suspension. Seat to head transmissibility ratio of the active suspension system is analyzed and compared with the passive suspension system, driving through random road profile.
- Development tools, such as use of CAE tool to pre-evaluate the body pressure distribution plot on automotive seating, using finite element analysis (FEA). Human dummy backs and butts are now made of deformable finite element tissue—traditionally they've not been deformable—which gives more realistic direction of body pressure distribution; Comfort is an objective information that is related to the occupant's perception of comfort.
- Comfortable head and neck postures in reclined seating. Little information is available on passenger preferences for posture and support in highly reclined seat configurations. To address this gap, a laboratory study was conducted with 24 adult passengers at seat back angles from 23 to 53 degrees. Passenger preferences for head and neck posture with and without head support were recorded. This paper presents the characteristics of the passengers' preferred head support with respect to thorax, head, and neck posture.
- Numerical methods for combined analysis of seat and ride-comfort. Numerical simulations represent a highly reliable, cost-effective method to evaluate the seating and the ride comfort. There exist several approaches using FEA for seating comfort and MBS (multi body system) analysis for riding comfort. Although both parts influence each other there exist no real interfaces between the different types of analysis.

In a different context, Jaguar explained the perfect driver seating position! In a new video, Jaguar demonstrated exactly how to use these features to find the perfect seating position. The advice comes from Steve Iley, Jaguar Land Rover's CMO (Chief Medical Officer). Advice includes:

- Before putting a seatbelt on, the driver should move their butt is all the way to the rear of the seat and have their whole back touching the seat so their spine and pelvis are aligned and straight. In this position the driver's thighs should be resting on the seat without any pressure points.
- With both hands on the wheel, make sure the arms aren't straight and have a slight kink at the elbow.
- And of course, to empty out your pockets, thus minimizing hard points!

NHTSA (the US National Highway Traffic Safety Administration) urges drivers to sit at least 10 inches (25 cm) from the steering wheel—as far back as they can while still comfortably reaching the pedals and wheel—to minimize the potential for serious injuries from the airbag.

Toyota presented at the last Paris Motorshow their Kinetic seat, inspired by a spider's web. "A synthetic spider silk" flexible enough to fit the contours of the body, spread its weight and "make sitting more comfortable, longer," says Toyota. Its designers promise better stability of the head, optimal support, and lightening of the vehicle, but this is still a concept; Toyota says it is still too early to talk about concrete application. As with most design exercise, it will likely positively influence development of production seats.

At a recent conference at SIA (French Society of Automotive Engineers), Faurecia's Anne Isabelle Da Costa explained that the concept of comfort has evolved towards wellbeing on board. Wellbeing is better quantifiable since it is possible to collect more data such as respiratory and cardiac rhythms. Its development also requires acquiring new knowledge and looking beyond the automotive ecosystem, including input from doctors, psychologists, and athletes.
Wellbeing is a multidisciplinary dimension that must take into account new societal trends. Multiple use cases must be considered, for example, seniors and young people do not have the same expectations or the same needs. A great diversity in vehicle occupant age, sex, ethnicity, culture, size, shape, etc also imposes a need for personalization of wellbeing, creating in particular several acoustic or thermal zones. New technologies give the opportunity to know more about each occupant. This data collection would be possible with new interfaces while artificial intelligence and deep learning techniques will capture preferences and offer better benefits. Wellbeing now requires information broader than that limited to the passenger compartment.
Tomorrow's connected, autonomous, and shared mobility is taking into account whole new usage scenarios wherein wellbeing is the aggregate measure of user experience—as it is for any other section of life (office, home, recreation...).

INTERIOR NEWS

AV Interior Safety Equipment: No Belts, No Bags?

That dream may come true someday, later than soon. It presents challenges beyond just the odds of a crash; even if there were no requirement, many anxious passengers would like to feel protected anyway—it is a known phenomenon that people using driving simulators or playing driving video games often feel uneasy because they are not wearing a seat belt, even though there is no chance they will actually need it. In any event, for the next few decades AVs will share roads with conventional vehicles driven by fallible human drivers. For the foreseeable future there will be crashes, and AVs will have to have seatbelts and airbags. How can that need be reconciled with the much wider range of occupant positions that could occur in an AV?

Speakers at the recent WardsAuto Interiors conference addressed the topic, with a focus on touchable technologies to protect awkwardly positioned occupants in the severest crashes.

Rich Matsu, senior director-Engineering at safety systems supplier Autoliv, predicts that 10 years from now, only 1% of vehicles on the road will be fully autonomous with the remainder mostly Level-1 or -2 and only 10% at Level-3 or -4.

Safety architecture is completely different as seat and occupant positions are moving around the cabin. "Where do you put an airbag if the seat spins around?" Matsu asks, showing examples of airbags that pop out of the sides of seats or partially envelop the seat occupant. Matsu sees the installation of safety systems such as airbags increasing—not decreasing—as AVs become more common and crash safety becomes more complex, including occupants in weird position because of new mobility scenarios at Level 3-4. He shows a variety of airbag concepts that surround reclining occupants like a cocoon or shoot up from the floor between two facing seats.

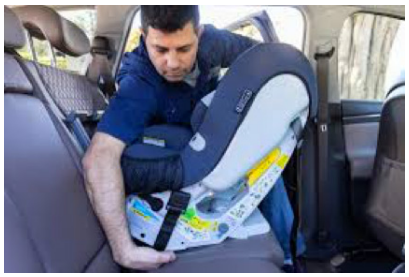
Future safety systems also will use electrically powered seatbelts plus sensors to detect the size and age of occupants, and probably position, to prevent too much force being applied.

The top factors contributing to road fatalities and injuries today are driver distraction, sleepiness, emotion, and stress, says Tamara Snow, in charge of systems technology at Continental's North American interiors division. These factors will continue to hold major influence, especially within takeover phases of Level 3-4 (when driver needs to take command back from the robo-car).
Silicon Valley's typical development approach of permanent disruption must be tempered when it comes to maximizing passenger safety, was a message from both speakers. Going through a

disruptive phase is necessary for innovation, but that needs to be followed by a cautious implementation stage before vehicles enter the marketplace, they say.

Autoliv's Matsu says reaching industry goals of zero crashes and zero fatalities will become increasing difficult as ADAS systems slowly eliminate the "easy-to-avoid" scenarios that account for 85% of serious crashes.
As autonomy creates more ways for seats and interiors to be configured, Matsu says, there will have to be a major shift to more simulation testing and predictive engineering tools.

Toyota, Subaru are Tops in Kid Seat Ease: IIHS



Toyota and Subaru are leading the way in making child restraints more accessible in their vehicles, while the American auto brands lag on this. That's according to IIHS (the US Insurance Institute for Highway Safety).

The two Japanese car makers ranked highest in 2019 model ratings for ease of use, with seven models each assigned the top "good+" IIHS rating for LATCH accessibility, followed by Honda, with four. Only one US-brand vehicle, the Jeep Cherokee, earned the top rating. No products from GM or Ford were ranked in the top categories. The IIHS rated four vehicles in the "poor" category: the Ford Fiesta hatchback, the Ford Fiesta sedan, the Infiniti Q70, and the Jeep Compass.

LATCH stands for Lower Anchors and Tethers for Children. The system is known as ISOfix in Europe, and as LUAS (for Lower Universal Anchorage System) or CANfix in Canada. It's a system for securing a child seat using straps or bars from the seat that connect to metal anchorages built into the vehicle. LATCH is required on car seats and in most 2003 and newer vehicles in the American markets, 2001 in Europe, 2015 in Australia, and various other years in various other markets.

The IIHS began rating automakers' LATCH hardware for ease of use in 2015. An IIHS representative says Subaru stands out for having prioritized improvements to its LATCH hardware.

Evoque Brings a New Way to Look Back

In the restyling of the Evoque, we find an unusual interior rearview mirror capable of turning into a screen. This option, called ClearSight, aims to improve the driver's rearward seeing. Land Rover placed a camera in a small fin located at the rear of the roof. The driver can choose to use the

mirror in a classic configuration, or to constantly display what the camera is picking up.

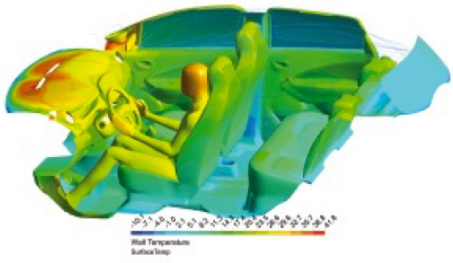
Visibility with classical interior rearview

Visibility with Camera

Advantages? Clear rearward seeing when the interior sightlines are obstructed by a passenger or a cumbersome object like a moving crate (picture, left)—with ClearSight the view is clear (picture, right). The screen is HD; brightness and up/down angle of the camera are adjustable. And speaking of the viewing angle, it is much greater than with a conventional rearview mirror. Instead of the view being framed and constrained by the rear window, the driver gets a good, 90-degree view of everything behind—including today's blind spots.

But could there be challenging unintended consequences? Even though the technology brings a real gain in visibility, it could bother the driver. Consider: even with the application of the reversing camera, many drivers continue, for a long time, to turn their head around to do the maneuver before gradually trusting what he sees on the screen and coming to understand the distances via the camera. Additionally, some testers report that it is necessary to refocus the eyes when looking at the screen (ocular accommodation) but it is probably a question of habituation.

Putting EV HVAC On a Diet



Accelerating adoption of electric vehicles requires increasing their range and reducing their total cost of ownership. HVAC (heating, ventilation, and air conditioning, including defogging, that is thermal management of the cabin) can consume as much energy—or even more—than is necessary for propulsion, depending on the driving and weather conditions. In fact, HVAC power demands can cut the range of an EV in half!

Vedecom, the French Institute for Public-Private Partnership Research and Training dedicated to individual, carbon-free, and sustainable mobility, launched a collaborative project with PSA, Renault, Valeo, and Faurecia to reduce the impact of cabin thermal management on energy consumption and battery life in EVs while improving the thermal comfort of the occupants.

The project includes development and deployment of multi-physics simulation tools capable of predicting the impact of different cabin thermal conditioning technologies on occupants and vehicle energy consumption and to validate and improve the predictions of thermo-physiological models, sensation, and thermal comfort by investigating the possibilities of their personalization. All of which is to say, this project's laudable goal is to use sophisticated scientific model to develop user-centric design and personalized experience.

VW Shows Holo-Controls

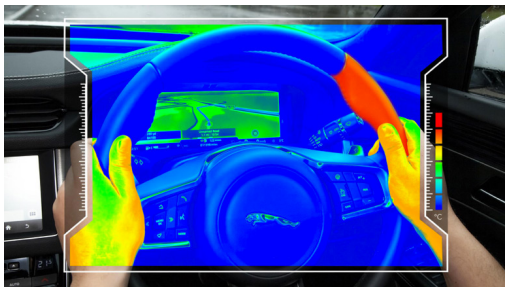
It sounds like something straight out of "Star Trek", but it's real: during their annual meeting on Lake Wörth in Bavaria, Volkswagen unveiled a prototype car with amazing 3D holographic controls and displays for its multimedia system. The Golf GTI Aurora prototype, seen for the first time at that meeting, has a fully operational audio system controlled by hologram—a world first.

The trunk of the car holds no luggage or cargo; when it's opened, a hologram displaying the controls of an audio system appears, floating above a black screen embedded in the floor. This hologram can be used to control the 3-kilowatt sound system with simple hand gestures. You press the start, stop and pause buttons floating in space, use your fingertips to select an album from floating, animated playlists in the form of cubes, and adjust the volume with a control projected in the air. Unlike 3D movies, where the public must wear special glasses, the GTI Aurora holograms do not require any additional equipment.

While this preview establishes that holograms are no longer reserved for the cinema world, VW Group's head of components development Mark Möller acknowledges their commissioning in a specific vehicle is not planned yet. But we can already guess that when it eventually happens, the module will be positioned somewhere else in the cabin!

JLR Cools, Colors it

The steering wheel, we mean. Jaguar Land Rover has a technical innovation: a steering wheel that changes colors and temperatures to give information to the driver.



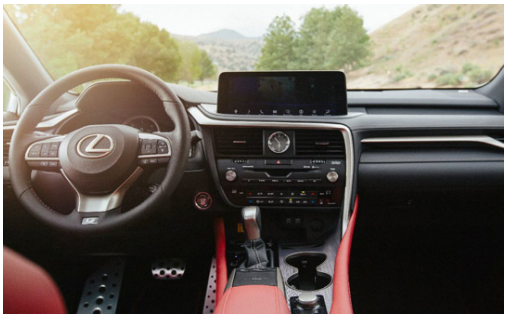
JLR says distraction is responsible for 10 per cent of fatal accidents in the United States, and they want to pass information to the driver without distracting their attention from watching the road. The type of information transmitted could include the announcement of a sharp turn, an inconspicuous crossing in bad weather, a low fuel level, or less safety-critical information such as a point of tourist interest. The goal would not be to transmit emergency information; that would still be done by sound and/or vibration.

The wheel's color variation would be related to the temperature variation by slightly but quickly heating or cooling different areas of the steering wheel in a temperature range of 6 Celsius degrees—enough to alert the driver not only visually but also by the sensation of touch. JLR also imagines an application on gearshift paddles that could be used to alert drivers when the vehicle control shifts from human to autonomous control.

Development of this innovation was carried out in cooperation with the University of Glasgow. There have been no plans announced for this new kind of steering wheel on a production vehicle.

Lexus RX Gets Comfort, Safety Upgrades

Traditional yearly refreshes bring new upholstery and a few features in the interior. But Toyota went beyond that in the 2020 Lexus RX 5-seater and RXL 7-seater by completely revising the infotainment system.



"We've listened to our guests. We know that they want more intuitive telematics with increased functionality," said Lisa Materazzo, vice president of Lexus marketing. "The majority of the interface can now be done on the screen."

An additional 12.3" touchscreen is paired with a center console mounted remote pad, maybe a bit too close to the shifter. The former display-only screens above the instrument panel has been moved closer to the driver and will now have touchscreen interfaces. This onboard infotainment

systems in the two RX models will support both Apple CarPlay and Android Auto to facilitate whatever type of phone the driver might have.

Driving dynamics and interior comfort have been improved through additional fine tuning on suspension and rigidity, and noise and vibration reduction.

Safety and comfort improvement have been the focus, as always when moving to more automation in vehicles. A suite of driver assistance and automated systems has been introduced, including the ability to detect bicyclists as part of its enhanced pre-collision system on top of motorists and pedestrians detection. It can also assist drivers with road sign recognition by displaying on the instrument panel road signs it senses, as well as a lane-tracking assist system which helps keep the vehicle in the center of its lane when adaptive cruise control is on.

Active sound control, electric power steering and a heated steering wheel round out the upgraded package offerings.

Renault's New SUV Coupe

Unveiled as a show car in 2018, the Renault Arkana is a 5-door coupe as well as an SUV. It's manufactured at the Renault factory in Moscow, Russia, and will be marketed locally next summer; it will also be offered in South Korea with a Samsung badge.

The Arkana—Renault says the name comes from arcanum, Latin for "secret"—is developed on the basis of the Dacia Duster. It's got the same dashboard, but compared to the Duster the Arkana wins in refinements including an 8-inch central touch screen with Easylink multimedia system compatible with Android and others, a new center console, and exclusive inner doors with color-adjustable ambient LEDs.

In all configurations, the Arkana will be offered with keyless access: the car can be opened without getting the key card from your pocket, and the doors will be locked automatically when the owner steps away. With the buttons on the key card it will be possible not only to open and close the cross-compartment, but also to remotely start the engine from a distance of up to 200 meters.

As the Arkana is promoted as an SUV, rear interior volume is a priority. Renault says that despite its coupe silhouette, the new car will handle a load volume of 508 liters (18 cu ft), or up to 1333 liters (47 cu ft) with the rear seats folded.

NEWS MOBILITY

Autonomous Auto Service Study Starts at Singapore School

EasyMile, the AV tech specialist based in Toulouse, France, is launching a trial with its EZ10 autonomous shuttle at—and with the cooperation of—the National University of Singapore (NUS) as part of a year-long study aimed at gauging the commercial viability of such a service.

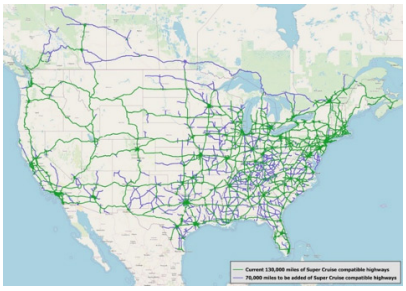
The shuttle service, called NUSmart, will be operated by ComfortDelGro. It will first embark on a 1.5-month long road test at NUS' campus before commencing the trial proper. This trial is in line with NUS' ongoing efforts to build a smart, safe and sustainable campus.

The road test began last month on a 1.6 km (1 mile) route on campus. The main purpose of the road test is to map the route through the collection of data for the vehicle's navigation systems. To ensure this is done accurately, the shuttle will be travelling at between 5 and 16 km/h (3–10 mph) in this phase. Upon completion of the mapping process, the NUSmart Shuttle will run a validation test for three hours daily over a four-week period. During this time, the shuttle will not be taking passengers.

Following the road test, the NUSmart Shuttle is expected to commence the passenger service trial in the third quarter of the year. The NUSmart Shuttle will be running in real mixed traffic conditions alongside regular buses, cars and motorcycles throughout the road test and trial period. A safety operator will also be on board the autonomous shuttle, not only for safety but also to provide information to passengers and ensure they are relaxed on the autonomous vehicle.

GM Extends Super Cruise Roadways

General Motors just announced they have added 70,000 miles (over 112,000 km) of navigable divided highway in the U.S. and Canada to the Cadillac hands-free driving system called Super Cruise, increasing the total amount of compatible roadspace to 200,000 miles (320,000 km) by the end of this year.



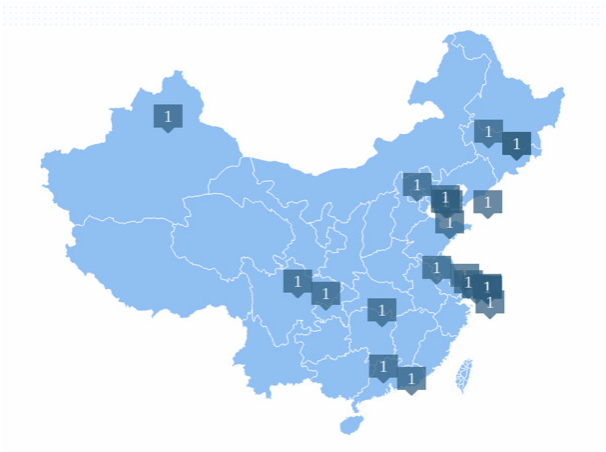
Super Cruise enables hands-free driving where conditions permit its use, combining car equipped technology (analogous to Tesla's Autopilot) and a very detailed understanding of the road system.

It uses cameras, radar, and lidar mapping data, combined with a driver attention technology to ensure their eyes are on the road. Drivers can look away for a few seconds, perhaps for conversation or a glimpse out the window, but more than that and the system issues a warning for inattentiveness.

Original detailed mapping has been created through test vehicles, with lidar map data and high-precision GPS. Now, Cadillac tracks the number of miles its customers are driving with Super Cruise, as well as how many times the system disengages due to the likes of invisible lane lines, sunlight "blinding" a sensor, or other such factors, and when the car forces the driver to take control, as Super Cruise alerts drivers when needed. The broadened deployment will include an enhancement for limited intersections and traffic control devices, for example railroad and pedestrian crossings, as well as stop lights and stop signs.

The phased pace of roll-out demonstrates that automated driving needs enhancements in parallel on car technology and road infrastructure alike.

VW's New China Ventures



VW Group current production plants in China

The Volkswagen Group has announced, in quick succession, two major evolutions concerning its presence in China, the company's biggest market. They've signed an agreement with Chinese

partner JAC for the re-introduction of the SEAT brand in the Chinese market in the next two or three years. The JAC–VW joint venture, headquartered in Anhui province, was created in 2017 for the development and production of electric vehicles. The SEAT agreement is an additional step for the globalization of that brand, and an opportunity to develop a specific platform for small electric vehicles. So that's number one.

Number two, they've signed an agreement to focus on the development of future mobility solutions with its associated mobility company Mobility Asia, JAC, and the Government of Hefei. In the city of Hefei (also in the Anhui province), the requirements for the future of mobility will be tested. Around eight million people live there, which is a suitable ground for testing and developing new mobility solutions. The focus of the partnership is the development of autonomous driving. Volkswagen Group China, Mobility Asia, and JAC will pool their resources and collaborate on autonomous mobility services, including self-driving vehicles (robo-taxis) and autonomous fleet management. In addition, the Smart City partnership includes areas such as railings and car sharing.

Hyundai's First Electric Double-Decker

Mass transit vehicles have a major role in the new mobility world, and it's interesting to notice that EV buses are popping up all round the planet, including BYD's 10-metre-long (33 ft) double-decker bus in London three years ago. Now Hyundai is playing leapfrog: their new electric double-decker is 13 meters (43 feet) long!

What is the value of an EV bus? It improves air quality in the city centers and at immediate proximity of the roadways, thus eliminating a longstanding nuisance and health hazard to passengers waiting at bus stops and drivers stuck in traffic. And an EV bus is quiet, unlike diesel-driven buses' snarling roar—that's better for city dwellers trying to talk, hear, and sleep, and it's better for bus passengers, too.

The new bus can accept 70 seated passengers in 11 seats on the lower deck and 59 up top, plus standing capacity. Range and battery recharge/swapping particulars have not been published; these key capabilities are essential for buses that must cover long routes, so we will be interested to learn how the new bus will do.

GENERAL NEWS

Renault-FCA Merger Talks Fall Through

Fiat Chrysler abruptly withdrew a proposal to merge with Renault, shocking many in and around the auto industry who fully expected the deal to go through. Nevertheless, both sides are speaking carefully now, in tones that at least hint at prospects for negotiations to begin again.

The proposed merger would have created the world's third-largest carmaker, worth nearly USD $40bn, but discussions fell through suddenly after the French Government (Renault's № 1 stakeholder) requested a five-day extension to get Nissan onside. Nissan, of course, is one of the three corporate parties to the Renault-Nissan-Mitsubishi alliance.

FCA said it remains "firmly convinced of the compelling transformational rationale of a proposal," noting it had been widely well-received in markets and in the industry and would have delivered benefits to all parties. "However, it became clear that the political conditions in France do not currently exist for such a combination to proceed successfully," the FCA statement said; "FCA will continue to deliver on its commitments through the implementation of its independent strategy."

There were some ruffled feathers and hurt feelings in response to Fiat Chrysler blaming "political conditions in France" for the cancellation; French officials bristled and blamed FCA for exerting "massive" take-it-or-leave-it pressure behind the proposal. Later, though, an official at France's Ministry of Economy said the French side has "closed no doors" with regard to the talks.

For their part, Renault has expressed disappointment over the lost opportunity, but spoke about it not in the past tense but in the present, saying they "view the opportunity as timely, having compelling industrial logic and great financial merit, and which would result in a European-based global auto powerhouse."

Meanwhile, a representative of the powerful Metal Mechanics Union in Italy struck an optimistic tone, hoping that the withdrawal is a tactical gambit: "The demands of Nissan and the French grandeur have caused the French and Nissan to miss a great industrial and economic opportunity," Claudio Chiarle of the FIM-CISL union told the ANSA news agency. He said workers in both countries stand to lose if the opportunity crumbles.

Auto analysts Philippe Houchois and Himanshu Agarwal at Jefferies also noted that the Fiat Chrysler statement was carefully worded in a way "to leave the door open to further discussion."

The French Government holds a 15% stake in Renault, and put four conditions on the deal: any

merger must be completed as part of the existing alliance between Renault and Nissan; must preserve French jobs and factories; must respect the governance balance between Renault and FCA, and must ensure participation in an EV battery initiative with Germany.

French Minister of Finance Bruno Le Maire said agreement had been reached on three of those requirements, but "it remained to obtain explicit support from Nissan", which had earlier expressed reservations about the deal, saying it raised questions about its alliance with Renault.

The Renault board had met Wednesday evening for a second round of deliberations on the proposal for a 50-50 merger, which the carmaker said would save more than $5.6bn annually in purchasing expenses and AV/EV development costs. The combined company would have produced about 8.7 million vehicles each year—more than General Motors, with only VW and Toyota making more.

The merger would have brought FCA's brands—Jeep, Chrysler, Alfa Romeo, Lancia, and Fiat—under a common umbrella with Renault Group's Renault, Dacia and Lada brands. The merger would also have given Renault access to the North American market, which it left 30 years ago in 1989, while FCA would have gained clout in Russia, the French carmaker's second-biggest market with its AvtoVaz unit, which builds Ladas.

News of the plan's failure dinged Renault's shares, which fell 7% to €52.45; FCA's share price faltered, but then rallied to trade up 1% at €11.83.

BMW, JLR in EV Parts Pact

BMW will develop their next-generation electric motors, transmissions, and power electronics with Jaguar Land Rover, unveiling yet another industry alliance designed to lower the costs of developing electric cars.

Pioneering BMW i3 EV

Car of the Year: Jaguar I-Pace EV

"Together, we have the opportunity to cater more effectively for customer needs by shortening development time and bringing vehicles and state-of-the-art technologies more rapidly to market," BMW Group R&D boss Klaus Froehlich said.

Both companies will produce electric drivetrains in their own manufacturing facilities, BMW said.

Jaguar Land Rover are still run by former BMW managers, including Ralf Speth the company's chief executive who spent 20 years at BMW prior to joining JLR, and Wolfgang Ziebart, the engineer who

designed the iPace. Ziebart is a former board member responsible for development and BMW.

Jaguar Land Rover say they will redouble efforts to cut costs after they posted a $4bn loss earlier this year, hit by a downturn in demand for SUVs in China and a regulatory clampdown on diesel emissions.

FCA, Aurora in Commercial EV Cooperation Accord

Fiat Chrysler Automobiles (FCA) will collaborate with the American startup Aurora, specializing in autonomous driving. The companies have signed an agreement in principle to set up what they're calling a "powerful partnership to develop and deploy standalone commercial vehicles". The idea is to integrate Aurora's autonomous driving platform into Fiat Chrysler's commercial vehicles.

Founded in 2016, Aurora has attracted international investors raising USD $530m in February 2019 from Sequoia Capital. A year earlier, the young startup was boosted with an alliance with Volkswagen and Hyundai. Since then, their solutions have been integrated into six vehicle segments, from sedans to the SUVs to several lines of commercial vehicles. Aurora called for sector skills, starting with its founders: Chris Urmson, former technical director of autonomous cars at Alphabet (parent company of Google), Sterling Anderson, former director of the program Autopilot Tesla (two years) and Drew Bagnell, former head of Uber's perception and detection division, have extensive experience in the sector.

FCA is already present in the autonomous driving sphere, notably via a partnership to supply vehicles to Alphabet subsidiary Waymo.