DVN-I
Automotive Interior

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Editorial

DMS Will Gain Traction Before Self Driving

EYE-BASED DRIVER MONITORING SYSTEM (HARMAN)

The automotive industry faces mounting and sobering evidence that a real self-driving revolution is *not* just around the corner; in fact, it remains years away. Among other reasons, it's become clear that the longer a driver uses partial automation, the more careless they get. That’s the impetus behind the growing awareness that DMS (driver monitoring systems) can improve automotive safety; the European Parliament has updated its General Safety Regulation (GSR) for type-approval requirements, while the Euro NCAP (new car assessment program) is completing its DMS test protocols in preparation for requiring a good DMS for a five-star rating starting in 2024.

Another signal came recently from a provision in a major U.S. infrastructure bill to require technology in new cars to tell if a would-be driver has had too much alcohol, in which case the car would be disabled. Whatever that idea's merits and flaws might be, and whatever questions and problems it might raise, it is squarely within the remit of a

DMS. It confirms that regulators still see the human driver as centrally responsible for automotive safety, with or without support by ADAS.

So DMS are emerging as the crucial safety system in the middle of the shifting human-machine relationship. That's a fine reason to register for next month's DVN and DVN-Interior Workshop near Detroit (and online); you'll want to **do so** while there's still space for you.

Meanwhile, don’t miss this week's in-depth piece on zero-gravity seating!

Sincerely yours,

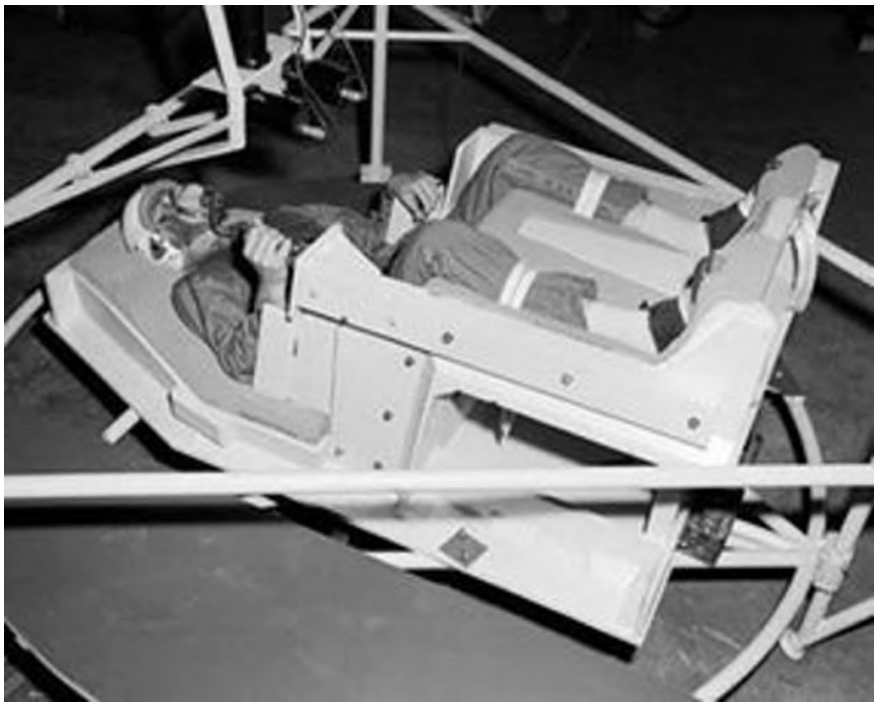
Philippe Aumont
General Editor, DVN-Interior

In Depth Interior Technology

Zero Gravity Seat

ZERO-GRAVITY SEATS IN A NISSAN ALTIMA (NISSAN)

Muscle fatigue is a serious consequence of prolonged sitting, whether in a lounge chair for a little nap, at a cinema or sports arena, or—perhaps most of all—for those seated in cars, planes, trains, and boats. To help relieve that stress on the body, seat makers focus on product designs to bolster body support and maximize overall comfort.



ASTRONAUT IN ZERO-G POSITION IN A SPACECRAFT SIMULATOR (NASA)

Research into the issue started with astronauts enduring sudden, intense increases in g-forces while escaping Earth's gravitational pull. It's important that they position themselves so that their bodies can deal with the strain. By assuming a specific reclined position, astronauts safely distribute the stresses of takeoff across their bodies. That position is called the zero-gravity (or zero-g) position, and the related seat is called a zero-gravity seat—which doesn't so much counteract gravity as it positions the sitter similarly to astronauts during liftoff. It has all to do with the recline position the chair can assume, to help distribute user's weight across the chair. Some manufacturers claim the reduction of bodily stress is so effective the sitter feels virtually weightless.

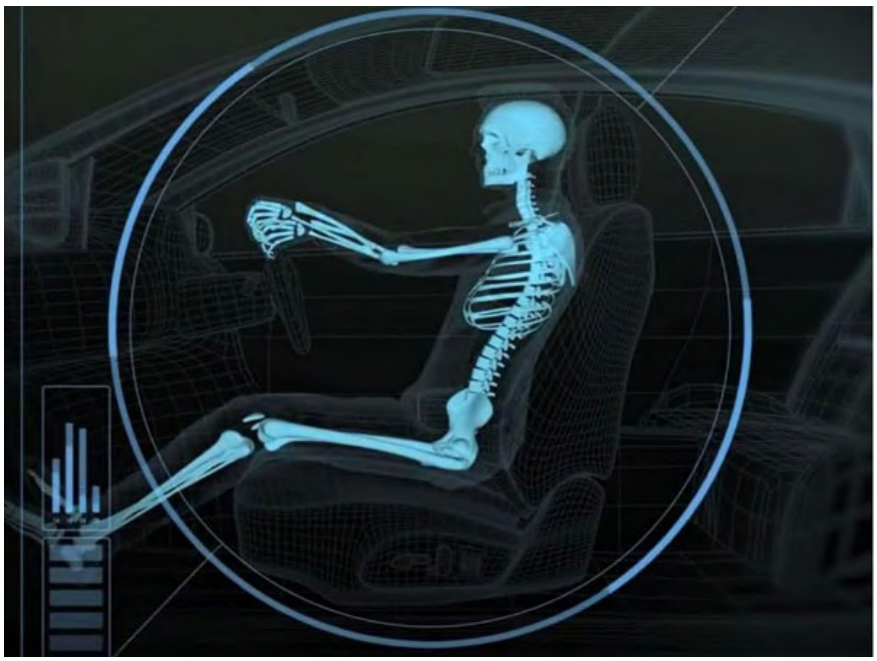
Now…why? The benefit of such a position is that it promotes circulation in the legs and reduces swelling. Elevating the legs over the level of the heart during rest can help prevent conditions like deep-vein thrombosis. Of course, the same effect can be had by lying down and putting a couple of pillows under your legs, but not while driving.

Therefore: zero-gravity seats from Nissan—and, presumably, from other automakers before long. They may be the answer, or at least a substantial chunk of it, to providing a relaxed and enjoyable experience for vehicle occupants.

Fatigue occurs when muscles in the body become tired from being in the same position for an extended period, such as during long commutes and road trips. A driver can feel worn out or exhausted after being behind the steering wheel for hours. The human body copes with this tiredness by micro movements, which increase spinal compression and curvature, putting pressure on the shoulders and back and leading to even more fatigue. Another option is just to change position, but vehicle seats are designed to constrain occupant positional shift; they have to remain in place to control the vehicle and be protected by the airbags.

To help reduce fatigue and make the driving experience more comfortable during long drives, Nissan has developed what they are describing as NASA-inspired zero-gravity seats, presented in an **online video**. They look pretty much like any other front seat, but are scientifically designed to help the human body take on a neutral spinal posture, which astronauts experience in the weightlessness of space. In this natural and relaxed position, the amount of stress placed on bones and joints is minimal.

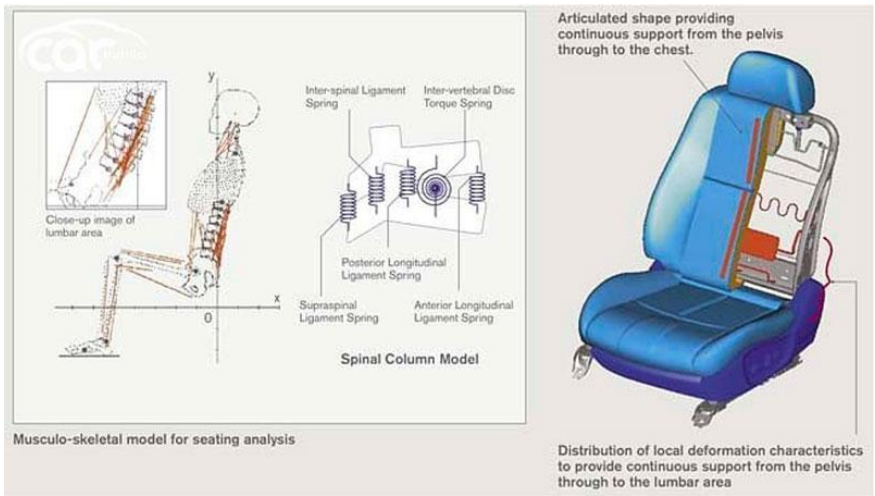
Zero-gravity seat technology aims to facilitate this neutral body and spine position using a patented shape and 14 pressure points throughout the seat back and cushion to provide continuous support that extends from the hips and tailbone up to the shoulders. When in use, the seat cushions flex to the body at each pressure point. The seat structure's ergonomic design maximizes blood flow in the lower extremities and reduces muscle loading in the legs and lower back. All of this reduces stress and keeps the driver's energy level up, allowing for a more refreshed feeling at the end of a long drive.



ZERO-GRAVITY POSITION (NISSAN)

Developed in conjunction with Yamazaki Laboratory at Keio University in Tokyo, Nissan's zero-gravity seat concept came to life using an in-lab seat simulator and a musculoskeletal model. The design also underwent extensive biomechanical analysis as well as real-world evaluations by professional drivers. Test drivers included men and women of varying heights and body types. The goal was to make the new seats effective for humans of all shapes and sizes.

In addition to studying the test subjects' biometrics, laboratory technicians took a panel of medical tests pre- and post-driving. For example, the technicians used blood samples to observe lactic acid levels, which indicate muscular strain and fatigue. Other automakers are likely following similar research and development processes.



MUSCULOSKELETAL MODEL (CAR INDIGO)

Nissan's work seems to have paid off. These seats were first introduced in the 2013 Nissan Altima, which gave a much more satisfying ride even after long journeys. They were then installed in many other Nissan vehicles; today the 2020 Rogue, Altima, Murano, Maxima and Titan all get them.

ZERO-GRAVITY SEAT FOR 2019 ALTIMA (NISSAN)

BMW

ZEROG LOUNGER SEAT (BMW DESIGN)

BMW, for their part, is working on a seat they call the ZeroG Lounger, slated for commercialization in the next few years. It can recline either 40 or 60 degrees, but the seatbelt moves with the passenger to avoid a constricting sensation. When reclined, passengers will get a perfect view of the screen that drops down from the headliner. BMW says the screen, which can show directional information, combined with the seating position, can also help reduce motion sickness while driving.

Faraday Future

FF 91 INTERIOR WITH ZERO GRAVITY SEATS (FARADAY FUTURE)

Faraday Future's FF 91 seats are also zero-gravity items, likewise described as borrowing principles from NASA spacecraft to evenly distribute body weight. The rear seats are 14-way adjustable and have 4-way adjustable lumbar support. They can also recline up to 60 degrees, and will offer a "spa mode" that heats and ventilates the seats and adjusts the interior lighting while playing mood music.

Adient

Adient Vice President Richard Chung demonstrated his company's zero-g seats in an **online video** filmed at NAIAS 2017.

Automakers are constantly striving to make every day driving more comfortable and enjoyable. Zero-gravity seats are an innovative and significant step in that direction. Expect to see more automakers integrating them into more models, sooner than later!

Interior News

Drunk-Blocker Requirement Could Accelerate DMS

INTERIOR NEWS

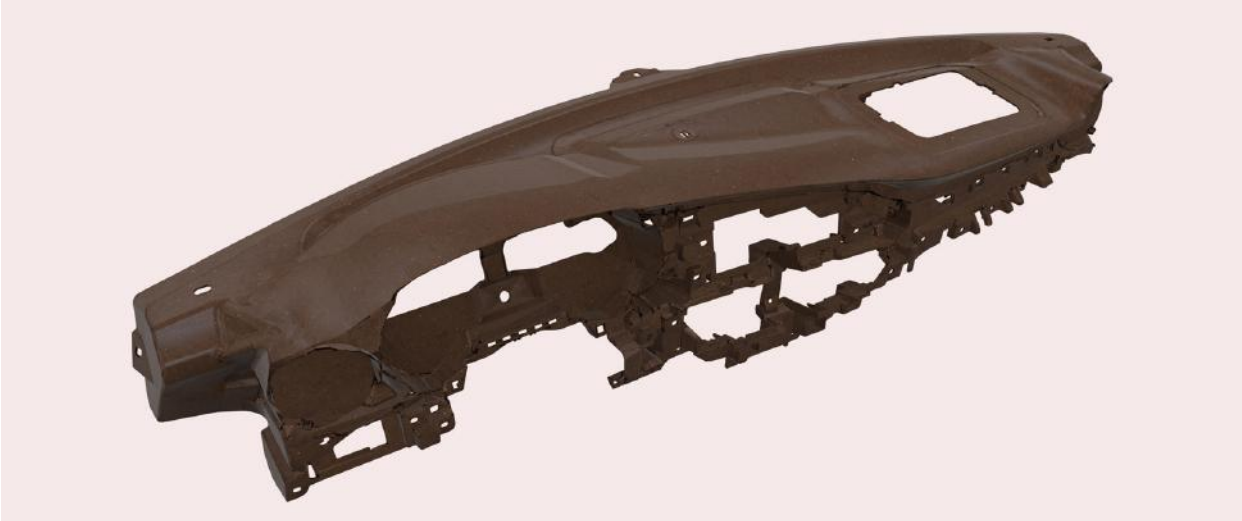
Companies developing driver detection technology could get a boost from a provision, tucked inside the 2,702-page, trillion-dollar U.S infrastructure bill, that would require automakers to equip new cars with technology to prevent alcohol-impaired driving.

Under the provision, the U.S. Department of Transportation would be directed to establish a safety standard within three years; automakers would then have another two years to implement technology that detects and prevents drunk driving. Driver monitoring systems (DMS) are likely to be the technology platform to host drunk-driver detection. Moves are already being made in Europe to encourage automakers to include drunk driving detection technology, specifically through camera-based DMS approaches. In 2007, Nissan revealed a concept car that used alcohol odor sensors, facial monitoring, and vehicle operational behavior to detect driver impairment. That same year, Toyota presented a similar system. Volvo announced in 2019 they would install cameras and sensors in cars to monitor drivers for signs of being drunk or distracted and then signal the vehicle to intervene, but that tech is designed for Volvo's SPA2 architecture for hands-free driving, which hasn't been released yet. In the

absence of a mandate, the industry hasn't been eager to commercialize the technology, despite much of the technological infrastructure already existing.

Sustainable Materials in Mass Production: Now's the Time

INTERIOR NEWS



NAFILEAN® DASHBOARD (FAURECIA)

Management briefing seminars organized by The Center for Automotive Research is an independent, non-profit organization producing industry-driven automotive research and fostering dialogue on issues facing the automotive industry. In a recent panel discussion called *Sustainability Trends in Automotive: Strategies for a Path Forward* with Ford, Faurecia, and BASF, the conclusion is that the time is right to not only develop sustainable materials, but to use them in mass production.

That's another paradigm shift for the industry, as most of sustainable or bio-based materials are more expensive than traditional ones, which goes counter to decades-long efforts at cost reduction. On the other hand, the price being put on CO_2 emissions tends to incentivize the transition.

The meter starts running right away with upfront costs, as new materials need to go through the whole validation process. Ford's Donna Dixon, chief engineer on the Mustang Mach E BEV, told panel attendees "It might cost you some upfront, but that's going to become your norm. Not only will the material likely cost more, but companies too will have to invest in modernizing the equipment that tests it". That approach yielded tangible progress in the sustainability of the Mustang Mach-E, including the interior door trim and the fabric wrapping the speakers. Faurecia and BASF are making good progress with recyclable hemp fibers (NAFIlean), and bio-based castor oil (Elastoflex), respectively.

"As you use and reuse, you're going to get the benefit from it," Dixon says of the initial added cost of sustainable materials coming down. "If we get the scalability on it and the cost sharing—the way you manufacture it, the cost shouldn't be a question." Panelists agree scalability is key to solving the cost conundrum for sustainable materials vs. traditional materials.

Lightweighting is also a benefit of new sustainable materials, and using less materials. Faurecia's Katie Roco, customer engineering director for its North American interior systems, says although a product may cost a bit more per kilogram, less material should be needed: "We're using better and we're using longer, so that will offset that maybe cost-per-kilo impact. What we're really delivering is cost neutral products to our consumers".

BASF is taking plastic waste and creating sustainable plastics via chemical rather than mechanical recycling, as well as working to scale up the process to achieve cost neutrality with sustainable materials. They also said BASF's Ultramid third-row seatback for the 2021 Toyota Sienna resulted in 30 per cent mass savings versus the previous 15-piece steel component.

Continental's Versatile In-Vehicle Computing Platform

INTERIOR NEWS

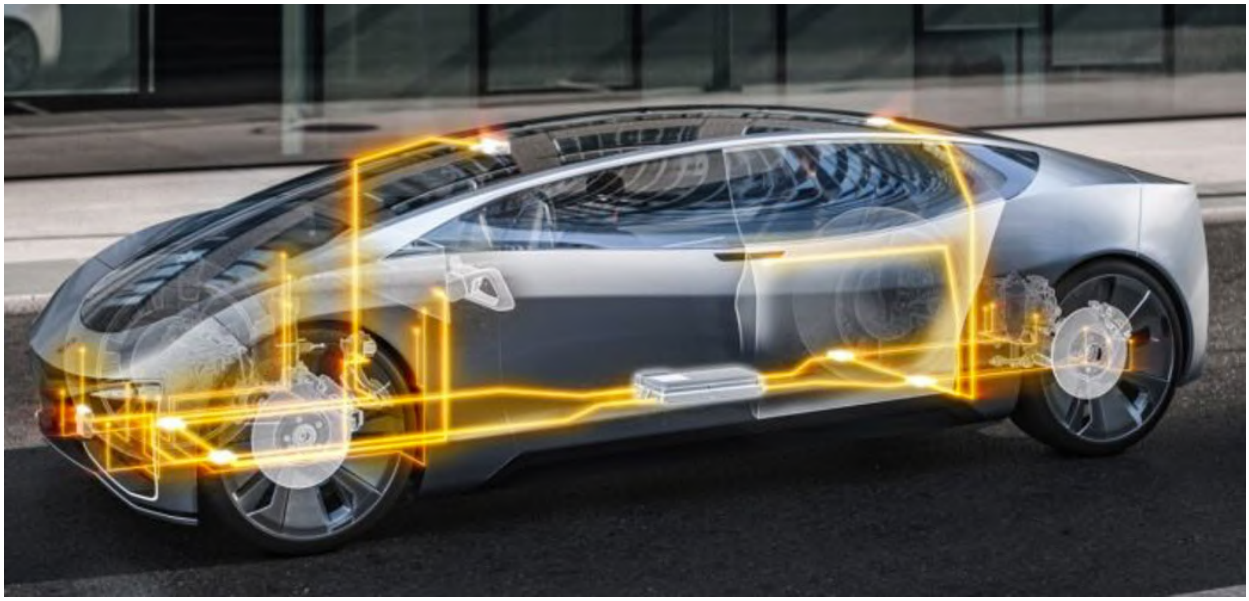


IMAGE: CONTINENTAL

After the start of production of their In-Car Application Server 1 in Volkswagen's ID.3 and ID.4 electric vehicles, Continental says they are assessing further series production applications of domain-specific high-performance computers, across more than 20 vehicle models from various manufacturers and brands, in 2021 and 2022. The company has orders for high-performance computers for vehicle cockpit, data management and vehicle connectivity, driving safety and dynamics, and automated driving, with a turnover of around €5bn.

Continental is already working on the next generation of in-vehicle computers, based around their Automotive Edge Platform. The aim is to create a hardware and software platform that provides functionality across a wide range of vehicle areas, from driving safety to entertainment, in order to offer automotive manufacturers, the greatest possible flexibility and modularity for designing vehicle architectures with minimum complexity. With the Automotive Edge Platform, Continental is focusing on a consistent connection of vehicle functions and services to the cloud and an integrated development environment.

This presents a challenge in enabling individual functional areas while retaining a holistic user experience. Connectivity and applications from consumer electronics, data management and vehicle connectivity are about mastering complexity and real-time requirements. Conversely, driving safety and dynamics and automated driving focus on strict requirements for functional safety and latency-critical vehicle regulations. The Automotive Edge Platform is a flexible modular system comprising high-performance computers, software and cloud platforms, and services and applications. The platform connects the vehicle with the cloud and, thanks to its modularity, simplifies the development, provision and maintenance of software-intensive system functions from the various areas of the vehicle.

In the future it should be possible for users to obtain desired functions through software updates over the entire service life of the vehicle. This is provided by the development environment for software-intensive vehicle architectures, which makes it possible to implement software, sensor and big data solutions in a fraction of the previous

development time and cost. In this way, vehicle software can be quickly and securely developed, tested and installed directly on vehicles, futureproofing functionality.

Continental also offers a variety of development kits, providing components for centralized vehicle architectures which act like a standardized and modular workbench, making it easier to develop and test functions. Use of the cloud also enables scalable and efficient testing and simulation of vehicle functions. The individual modules of the Continental Automotive Edge Platform are set to be presented in 2022.

Holoride's Immersive In-Vehicle Media Platform

INTERIOR NEWS

IMAGE: HOLORIDE

Holoride is a developer of in-car VR systems for the automotive industry. It creates a new media category for passengers by connecting, in real time, extended-reality (XR) content with data points from the vehicle: physical feedback like acceleration and steering; traffic data, and travel route and time.

Holoride released their Elastic Software Development Kit (SDK) on the newly launched holoride Creator space. Created to run on the Unit game engine, the world's leading platform for creating and running real-time 3D (RT3D) content, the Elastic SDK gives developers access to a powerful toolset to create immersive in-car gaming experiences.

Holoride is building the world's first in-vehicle immersive media platform by enabling real-time processing of motion and location-based data using the Unity game engine, Unity is a cross-platform game engine developed by Unity Technologies. The content of Holoride adapts to the movement of the vehicle and the route and synchronizes perfectly with the passenger's journey. In doing so, Holoride creates a new media category for moving vehicles called Elastic Content, which enables a novel approach to content creation.

The Elastic SDK is at the heart of this creative development process and is the powerful software that drives the Holoride experience. It is a creative reinterpretation of real-world maps and geographic information projected into the Unity scene, where creators work with content assets within the Unity Platform. Content creation requires no additional programming or development skills for an initial build and therefore lowers the barrier for content creators to get started immediately. By adding pre-built assets such as renderers, animations, rigid bodies and audio, Content creators can easily populate the worlds they create.

As people make better use of their travel time, Elastic Content in vehicles becomes an attractive option for passengers, whether for entertainment value or to reduce motion sickness. Access to more experiential reality (XR) and VR technology opens up more opportunities for developers to create content as vehicles become the next big thing in platform content. Creators can get started with the Elastic SDK, this prototype that provides all the essential data so developers can run real-world tests in a car. It will help turning vehicles into moving theme parks.

Ford's New Air Filter System

INTERIOR NEWS

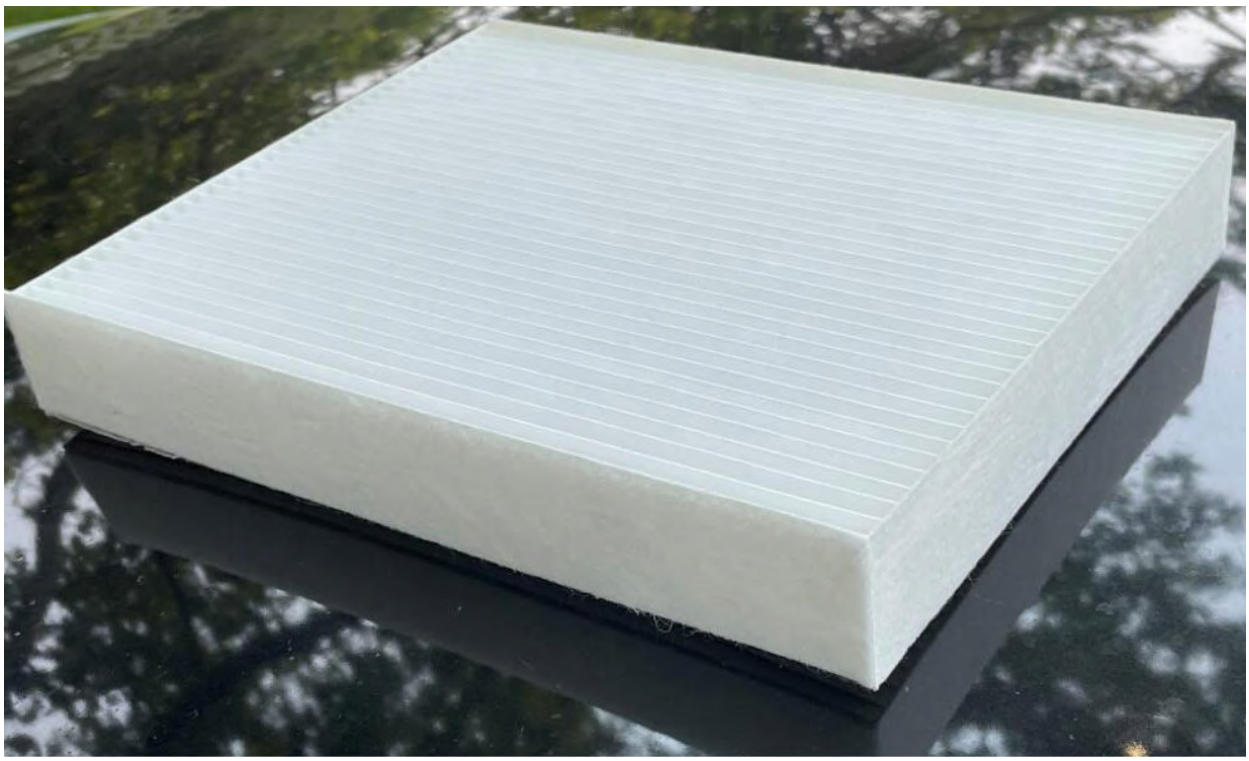


IMAGE: FORD

Ford will start putting a new standardized cabin air filter system in the majority of their vehicles by the end of 2023. It's called Refresh95 (MicronAir Protect in Europe). As air moves through the vehicle’s HVAC system, the filter culls out microscopic particles.

Ford says the new filter aims to reduce the concentrations of microscopic particles that can originate both inside and outside a vehicle’s interior. This is important because, according to the US EPA, particles smaller than 10 microns in diameter, particularly those smaller than 2.5μm called PM2.5, pose the greatest risk to health. The new filters are claimed to trap at least 95 per cent of particles under 2μm, which covers exhaust particulates and road dust, while also preventing ingress of 99 per cent of larger pollen particles. The filter design was put through comprehensive third-party lab certification testing, including pressure drop testing, to verify that it remains effective throughout the recommended service interval. Refresh95 availability is expected in fourth-quarter 2021 for selected vehicles, including the Bronco Sport, Escape, Explorer, Mustang Mach-E, Police Interceptor Utility, and Maverick. It will be also available as an aftermarket product, for compatible Ford vehicles.

Audi Skysphere Concept

INTERIOR NEWS

At the Monterey Car Week, Audi presented an electric L^4 roadster concept. The show car has probably little chance of series production, but is the first of three electric vehicle concepts that will lay out a path for Audi as they move away from combustion-engine power. The two other concepts are called Grand Sphere and Urban Sphere, and they are intended to define how users will interact with L^4 vehicles, as well as how those vehicles interact with their surroundings. The Grand Sphere will be presented at the IAA in Munich at the beginning of September, and the Urban Sphere will follow next Spring.

The Sky Sphere is a sleek, low roadster with a variable wheelbase. It transforms between autonomous grand tourer mode and human-driven sports car. In autonomous mode the display moves away from the driver, the rectangular steering wheel disappears under the dashboard, and the seats retract. In just a few seconds, the Roadster switches from active driving mode to autonomous lounge and relax mode.

"The architecture of the interior is changing more than at any time in recent decades," says Audi spokesman Marc Lichte. "The interior is becoming a free space for relaxation, networking and active communication." To increase ease of entrance to the cabin, its two doors are hinged in the rear. With its soft top removed, the car features a huge cabin dominated by capacitive controls and a door-to-door display screen that switches from a traditional display when being operated by a human passenger to an entertainment display when in autonomous driving mode.

To enable the car to cope with tighter situations, the engineers installed a four-wheel steering system in addition to the variable wheelbase. Even different gear ratios and steering settings can be implemented in this way. Driving comfort is also determined by electronics. The individual wheels can be raised or lowered selectively, the Skysphere thus becomes a glider. Designers worldwide need to think about the transition from drivers to users of autonomous automobiles to expand their thinking about how future vehicles should be shaped and should function. More in The Design Lounge.

The Design Lounge

Audi's Skysphere Concept

THE DESIGN LOUNGE

Audi's next three concept cars—the Skysphere just unveiled, and the Grand Sphere and Urban Sphere waiting their turn, outline Audi's strategy regarding autonomy and BEV architecture. The Skysphere, they say, is inspired by 1930s cars, particularly the Horsch 853A.

Using classical 1930s proportions but without the cumbersome drivetrain, the Skysphere incorporates two unique features only possible with a BEV architecture. An extending and retracting wheelbase, as seen in the Renault Morphoz concept, that changes the overall length by 25 cm from over 5 meters to under 5 meters. Also, where a classic ICE would reside, the incorporation of a large ‘frunk’ that fits two golf bags. Keeping within this classic theme, a pair of suitcases are now strapped internally under the rear windscreen where the 1930’s vehicles would have them strapped on the outside.

Like the Renault Morphoz, when the wheelbase is extended, the Skysphere is in a ‘touring’ (Audi says "grand touring") L^4 autonomous mode. When retracted, it becomes a human-driven sports tourer.

Further differentiating and enhancing these driving modes, the interior makes a dramatic transformation.

In the retracted-wheelbase mode the steering wheel, driver's dashboard, and floor console separate from the instrument panel and present themselves to the driver.

For L[4] autonomous driving, the steering wheel, the driver’s dashboard and floor console retract to become flush with a full-width digital instrument panel.

The surfacing theme is planar and angular, as opposed to the recent curved-screen technology used by other automakers.

With the dramatic movement of the instrument panel, the seats contrast this movement and seem to be in a fixed position. Using a more massive volume and construction they also integrate into the floor and cabin of the interior.

The only round elements are the four-ring Audi logo on the squircular steering wheel that has its center spokes located as low as possible giving the driver a unobstructed view of the full-length digital screen.

With the instrument panel pulled so far away, the interior feeling opens drastically allowing Audi to also integrate champagne flutes in the fixed portion of the floor console.

Audi's marriage of modern autonomous modes with a 1930s classical proportion has us eagerly awaiting the upcoming Grand Sphere and Urban Sphere; be assured we will analyze them as soon as they show up!

News Mobility

_Car Interiors Unplugged: On Hiatus

Car Interiors Unplugged will resume after summer.

How Safe Do Drivers Feel In Autonomous Vehicles?

NEWS MOBILITY

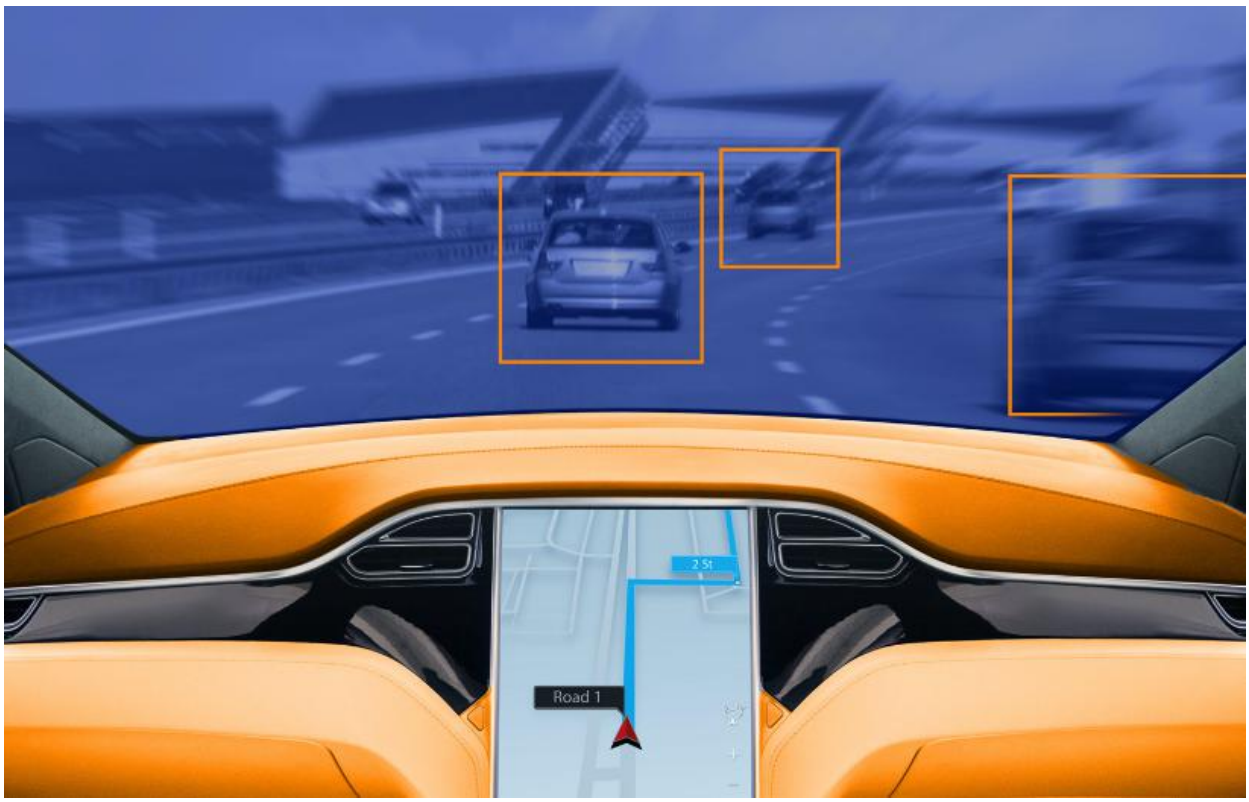


IMAGE: GUARDKNOX

A GuardKnox survey of over 1,000 vehicle owners in the US shows the challenge facing the automotive industry to change driver perceptions about the future of vehicles. Guardknox, from Israel, is a supplier of computing platforms. Their survey found that 62 per cent of drivers would not feel safe riding in a fully autonomous vehicle, 47 per cent feel concerned their vehicles could be hacked, and 82 per cent of drivers are unwilling to give up personal privacy for a more immersive in-vehicle experience.

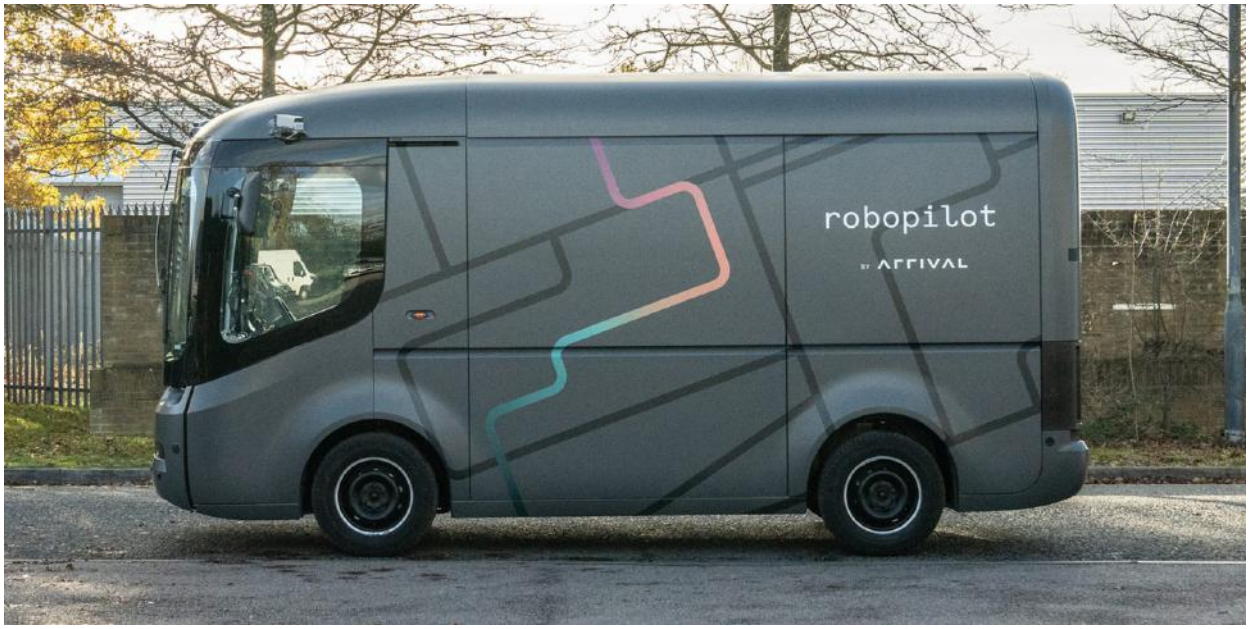
Additional findings include:
• 26 per cent of respondents are skeptical that autonomous vehicles will ever become a reality;
•64 per cent of drivers believe it will take at least another five years before autonomous vehicles become a reality;

• 62 per cent of Generation-Z respondents would not feel safe riding in a fully autonomous vehicle, compared to 51 per cent of millennials;
• 82 per cent of respondents said the car owner should have access to vehicle usage data, challenging the automaker's long-held ownership of such data;
• 61 per cent of respondents went further and said only the car owner should have access to vehicle usage data;
• 53 per cent of respondents were worried hackers could take control of their vehicle;
• Nearly 40 per cent were concerned hackers could gain access to their personal data, and
• Nearly a quarter of Gen-Z respondents (23 per cent) were not even aware a car could be hacked.

Even if there probably a little bias in the questions asked by a cybersecurity organization, it confirms in-vehicle experience needs peace of mind protection and that automakers and suppliers must take consumer concerns into consideration, and develop secure-by-design products.

Arrival, Microsoft Co-Develop iEV Open-Data Platform

NEWS MOBILITY



Microsoft and EV startup Arrival have announced plans to co-develop a cloud-based data platform enabling telemetry, vehicle, and data management for future electric vehicle fleets. With the help of Microsoft Azure, Arrival looks to streamline the sharing of data within fleet mobility.

Arrival is a technology company specializing in electric vans and buses. With headquarters in London and Charlotte, North Carolina, they're testing their autonomous driving technologies, while producing more and more vans and buses for customers in the US, UK, and Europe.

Arrival has been able to design and implement their own components, software, and assembly processes in unique ways to maximize all aspects of manufacturing. They recently began testing the automated driving system in their Arrival van without a human driver present. This autonomous technology was developed by Arrival through their own project called Robopilot. This project’s goal is to improve market knowledge, functionality, and public perception of autonomous driving systems.

Concurrently, there is no standardized method of organizing or managing the increasing fleets data flow. Arrival’s plan is to develop a single and open data platform using Microsoft Azure and machine learning that can be utilized by a wide range of customers—automakers, suppliers, cities, and freight and logistics companies.

General News

Novem Goes To Stock Market

GENERAL NEWS

IMAGE: NOVEM

The Novem Group supplies trim elements and decorative function elements for car interiors, providing the premium automotive industry with groundbreaking skills in surface finishing and superior expertise in engineering and product development.

Founded in Vorbach, Germany in 1947, the company has continuously expanded their global footprint in Germany, Italy, Czechia, Slovenia, China, USA, Honduras, and Mexico. Novem employs about 5,700 people at 12 locations and achieved revenues of more than €600m in FY 2020-21. Since 2011, Novem has been jointly owned by family-backed investor Bregal (best known for its fashion retailer C&A), and by management.

Novem trim elements are developed with a wide array of materials including wood, aluminum, and carbon surfaces, with functional integration, flowing lines on door trim, center consoles, belt lines and dashboards in car interiors.

Last month, Novem entered the Frankfurt Stock Exchange placed for a total volume of €247.2m with international institutional investors. This corresponds to approximately 35 per cent of their €710m market capitalization.

CEO Günter Brenner says "We are very pleased about the high level of interest shown by institutional investors during our roadshow. We take it as a clear sign that Novem's listing comes at the right time and that our investors support Novem's growth plans. The trust placed in us encourages and motivates us to continue to pursue this path and expand our leading market position".

Claude Tarrière Dead at 88: Father of Auto Safety Innovations

GENERAL NEWS

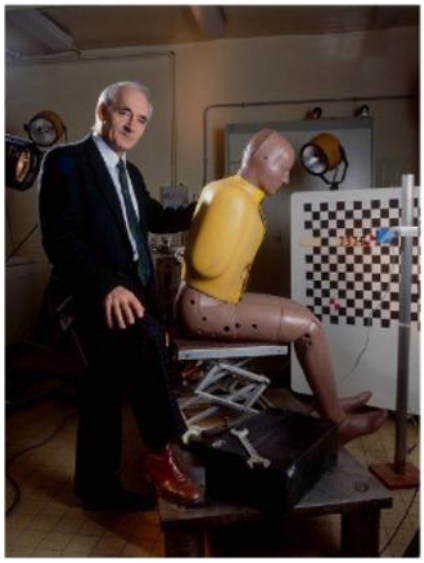


IMAGE: RENAULT

Renault's work toward road safety began more than six decades ago with the motivation of Claude Tarrière, a French doctor and pioneer in automobile safety.

He got his degrees in general and occupational medicine in 1960, and was hired by Renault after returning from his military service. His convictions and his stubbornness in reducing road accidents and their severity led him to create the Peugeot-Renault Association in 1969 in collaboration with teams from the Garches hospital. In the 1990s, this association became the Lab, Laboratory of Accidentology, Biomechanics and Studies of Human Behavior, the vocation of which is to help design and manufacture safer vehicles.

He had the idea of forming a team of researchers, young engineers and doctors and technicians, all highly motivated to invent and innovate by experimenting and testing with their colleagues from the Lardy Technical Center the first systems for the protection of occupants in car and initiate a new science in France: accidentology.

He began by studying the issue of driver vigilance, and then quickly broadened his field of investigation to restraint systems. It was under his responsibility that the study of the impact behavior of vehicles developed, through full-scale experimental tests and the use of rudimentary dummies. These studies led to the development of the three-point seat belt, a synthesis of the Swedish-designed diagonal belt which only retained the thorax, and the American-style lap belt. It was the first in a long line of safety innovations under his leadership. He leaves an immense legacy, at Renault, in France and in the international community of shock biomechanics and accident sciences: numerous publications of course, but above all a commitment and a strong conscience for saving lives. Claude Tarrière was a man of passion and commitment, scientist and man of action, and above all a visionary. Following his recent death, all Renault Group employees are joining forces with the Engineering teams to pay tribute to him.