Table of Contents

AEB Problems 2

Google Promotes Assistant Driving Mode to Mitigate Driver Distraction 6

Will China Lead the World in EV and AV Development and Sales? 8

The Company Profile: Hella KGaA Hueck & Co. 11

Stanford B-School Lecturer and Venture Capitalist Robert Siegel on Navigating Auto Industry Disruption 20
AEB Problems

Automatic emergency braking is saving lives. The rate of rear-end collisions is 50% lower for cars equipped with AEB, says the Insurance Institute for Highway Safety (IIHS), but there are big problems. Too many AEB-equipped vehicles suddenly brake when they’re not supposed to. Or they don’t work as advertised. Just this month the AAA (American Automobile Association) reported results from its tests of four 2019 pedestrian-detection equipped vehicles (Chevy Malibu, Honda Accord, Tesla Model 3 and Toyota Camry) concluding that the technology usually doesn’t prevent collisions with pedestrians. For example, in one of several tests, this one encountering a child darting from between two cars with the vehicle traveling at 20 mph, a collision occurred 89% of the time.

In March, the Center for Auto Safety petitioned NHTSA (National Highway Traffic Safety Administration) to initiate a defect investigation to consider complaints from numerous Nissan Rogue owners who experienced unintended braking by Nissan’s AEB system. According to the Center, “many complaints indicate that [unintended] braking is abrupt or forceful, endangering both the Rogue occupants as well as people in vehicles nearby who are forced to avoid a collision with a suddenly stopped vehicle.” NHTSA opened the defect investigation in September after gathering 843 complaints. Only 14 of those complaints were associated with crashes; just five injuries were reported and no fatalities.

According to Nissan, the AEB problems on the 2017 and 2018 Nissan Rogues are caused by false positives triggered by “unique road conditions such as specific railroad crossings, bridges and low hanging traffic lights.” The AEB system on the Rogue S and SV trims uses radar only, whereas the AEB system on Rogue SL trim, which includes pedestrian detection, employs both radar and a camera sensor. Nissan says it has launched field actions to notify affected customers while inviting them to bring their vehicles in for a software update.

False Positives
The Nissan software update will reduce the rate of false positives, but in doing so the rate of false negatives will increase. As a result the Nissan AEB system will be less likely to brake when it is needed. With any safety system there has to be a compromise between keeping false positives to a minimum.
vs. providing maximum safety benefits. “The system that has zero false positives and at the same time provides maximum safety benefit does not exist,” asserted Kay Stepper, head of automated driving and driver assistance at Bosch North America.

Despite the problems reported with the 2017-2018 Nissan Rogues, those vehicles still have a superior crash protection rating from the IIHS. I asked David Aylor, manager of active safety testing at IIHS, about that. “Our tests don’t look at false positives in giving a superior rating,” he said. “Our tests tell us that the vehicle is able to recognize a target like a car and it brakes. It met the requirements we set out. The Rogue would still perform well in our tests and has the potential to reduce the number of crashes.”

Euro NCAP doesn’t test for false positives either. “You could come up with a million false-positive tests and still not be sure the vehicle won’t have false positives. We don’t want to be doing that,” asserted Richard Schram, technical director for Euro NCAP. “That [testing for false positives] is the obligation and responsibility of the OEM.”

**Moving Away from Radar-Only Systems**

Some of the Nissan Rogue AEB systems under investigation were designed to operate with just one radar sensor. According to Mr. Schram, that is likely the root of the false-positive problem. Unlike a camera, radar can perform in bad weather and is not affected by varying light conditions, but since it only “sees” reflections, radar images are much lower resolution than camera images. It is hard to classify what the radar sees.

The radar used in the Nissan Rogues is supplied by Bosch. The AEB system was designed by Nissan. The camera used on some of the problem Rogues and the ECU come from other suppliers, not Bosch. In 2015 Bosch was advocating for radar-only AEB. Indeed, a Bosch executive told me at the time, “If you would like to make automatic braking systems with only one sensor, radar is that one sensor.”

According to Euro NCAP’s Mr. Schram, AEB systems on all Volkswagen Group vehicles with the exception of those from Audi are based on only one sensor, radar.
While carmakers have introduced radar-only AEB systems that are working well in the market, the industry now seems to be moving away from the radar-only approach. According to Bosch’s Mr. Stepper, “The trend is going to more sensors rather than less. Many in the industry, including major auto manufacturers, believe data fusion is the way to go: forward-looking radar and camera for the mid- to far-range.”

**AEB Safety Can Vary Widely**

The European Commission has issued regulations for AEB from 2022 onward. By then all new cars must have AEB car, AEB pedestrian and AEB cyclist as standard. By 2024 all cars sold, including older models, must also have AEB.

In the U.S., cars with AEB can be much less safe than cars with AEB in Europe. Carmakers representing more than 99% of the new-car U.S. market have committed to make AEB standard on all light-duty cars and trucks by no later than September 1, 2022. Cars only have to automatically brake for vehicles. There is no mention of protections for vulnerable road users. To satisfy their commitments new cars must only have forward collision warning system and an automatic emergency braking system that at least earns an advanced rating in the current IIHS track tests. The test requires only a speed reduction of at least 10 mph in either the 12 or 25 mph tests, or a speed reduction of 5 mph in both tests.

While pedestrian safety is not part of the 2022 U.S. commitment, IIHS says it has begun testing AEB systems for pedestrians to push carmakers in that direction.

By 2022 all new cars in Europe and the U.S. should have AEB as standard equipment. That is the good news. The bad news is there are no performance standards for AEB. “That will continue for a long time. We need to double our efforts to generate that,” urged Mr. Stepper. “Otherwise, how would a consumer know how much his AEB system will really help in the real world?” If the industry can’t get AEB right, it doesn’t have a prayer of getting self-driving right.

**Other Problems with Automatic Emergency Braking**

According to a September 2019 report in the Wall Street Journal, the National Highway Traffic Safety Administration has fielded more than 843 complaints in the last three years from drivers of model year 2017 and 2018 Nissan Rogues. It has also received complaints about AEB problems
in models from Volkswagen, **Honda** and other carmakers. Most reported false positives, braking when no obstacles were present.

In July 2019, **Kia** recalled 11,423 of its 2019 Optima sedans because the software for forward collision warning may prevent the AEB system from engaging when a potential collision with a stationary vehicle is sensed.

In October 2018, **Jaguar** recalled some 2018 Land Rover Range Rover vehicles due to malfunctioning AEB. On occasions when the AEB is disabled a warning light failed to alert the driver that AEB couldn’t be relied upon. An initial software update to correct the problem wasn’t effective.◆
Google Promotes Assistant Driving Mode to Mitigate Driver Distraction

In the latest statistics available, nine percent of U.S. motor vehicle fatalities in 2017—3,166 lives lost—were distraction related, according to NHTSA. Based on data from the national Fatality Analysis Reporting System (FARS), at least 434 of those fatalities were attributed to distractions associated with cell phone use. NHTSA cautions that collecting accurate FARS data is challenging, given factors such as the differences from state to state in police accident reporting procedures and often the need to rely on self-reporting of distracted driving by the individuals involved.

Cell phones are not the only source of distraction, of course. Eating, tending to children, reaching for an object, unrestrained pets in the car, the driver’s mental state—boredom or anxiety, for instance—can all cause a loss of focus on the task of driving. Research by AAA’s Foundation for Traffic Safety and the University of Utah in 2017 shows that touchscreen infotainment systems and vehicle controls, whether or not they include voice command options, produce an unacceptably high level of demand on a driver’s attention and create both visual and cognitive distraction, especially for older drivers.

Greg Fitch heads Google’s 11-member UX (User Experience) Research team for Android Auto. His team’s mission is to make using Google apps while driving effortless, seamless and safe, and get the driver back to the task of driving as quickly as possible. Google’s primary focus, Mr. Fitch says, is keeping the driver’s eyes on the road.

“We have a framework for structuring the research we do. Anything that involves heavy browsing is going to receive our attention first. Eyes-off-road time is the largest, most impactful form of driver distraction, so we are focused on minimizing that. The way Google generally does that is by enabling a ‘voice forward’ experience with our Google Assistant. Voice forward means instead of tapping on the screen to move through a task, you use your voice to get things done. In addition, we also use ‘Google magic,’ basically prediction [algorithms], to surface to the front, to the top of the screen what you are most likely to be looking for in the first place. You don’t have to dig through menus.”

Google currently makes its apps available to drivers with Android Auto, either built into the infotainment system or as a mobile app on a brought-in device. At the 2019 Google I/O event this spring, the company announced its plans to

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replace the old Android Auto with a new Google Assistant feature called Driving Mode. With more sophisticated prediction software and natural language skills, Google is betting the Assistant Driving Mode will enable wider use of its apps and services while not increasing visual-manual distraction behind the wheel. “The voice option will reduce distraction, but it is the algorithms, the prediction, that is really making the user experience better,” Mr. Fitch asserted. Speaking as a denizen of Silicon Valley, Mr. Fitch noted, “Driving is painful. People want to do things, be productive, get their time back.”

Cognitive Distraction
Google is primarily focused on reducing visual-manual distraction, but the issue of cognitive demands on a driver remains a topic of study. Mr. Fitch acknowledges that cognitive distraction indeed exists and needs to be minimized, but that it does not necessarily lead to an increased risk of crashing. “If something is cognitively distracting it is because it is hard to do. If it is hard to do it is not enjoyable. We are making things as easy as possible to do,” he said.

In June 2018, the AAA Foundation for Traffic Safety released another study by the University of Utah team, headed by distraction expert David Strayer. The work compared the visual-manual and cognitive demands of using Apple’s CarPlay and Google’s Android Auto with the demands of five different OEM infotainment systems.

The results of the research suggest that using either CarPlay or Android Auto was less demanding than using the native OEM infotainment systems for the tasks employed in the study, for example entering a navigation destination, selecting audio entertainment, making a call or sending a text message. According to the study: “Overall, CarPlay and Android Auto provided more functionality and resulted in lower levels of workload than the native OEM systems. However, both had moderately high levels of demand with each often having strengths where the other has weaknesses, providing the opportunity for both to improve the user experience.”

Android Auto is built into the latest version of the mobile operating system, Android 10, just released in September. GM recently joined Volvo, Renault-Nissan-Mitsubishi, FCA and BMW in publicly adopting the embedded Android Automotive OS platform for in-car infotainment systems starting in the 2021-2022 time frame. Google has commitments from other carmakers who have chosen not to announce their roadmaps yet. Google Assistant is built into both the mobile and embedded versions of Android and the forthcoming Google Assistant Driving Mode will replace the Android Auto phone app in the future; Google has not announced the current release date of the Assistant Driving Mode feature.
Will China Lead the World in EV and AV Development and Sales?

While no Chinese carmaker or supplier has yet made it to the automotive big leagues, many people think that will soon happen. The emergence of electric and self-driving vehicles is changing the game and China is poised to be a star player.

The idea that China could dominate has wide support:

“I am quite confident that China will build an automotive ecosystem as powerful as the existing incumbent regions,” said Bonifaz Maag, founder of the international management consulting firm Kugler Maag, which has an office in Shanghai.

“The country that trailed the world during the 20th century at developing cars that burn oil seems all but certain to lead in the 21st in developing cars that hum on wired juice,” wrote Jeffrey Ball for a Fortune magazine article published at fortune.com on August 20, 2019. BYD, BAIC and Geely ranked two, three and four behind Tesla among top makers of full-electric and plug-in hybrid vehicles globally, according to the piece.

And this from Stanford Graduate School of Business lecturer and venture capitalist, Robert Siegel, who told me: “The quality of Chinese engineering right now is phenomenal. To say they are any less than anywhere else in the world is naïve at best. … Look at the number of patents being issued in China across a variety of industries. Look at the number of PhDs. … China can say we are going to take these highways and make these lanes for autonomous vehicles; that is something you could not do in Europe or North America. The Chinese government just says it is so, and it is so. … We are going to see massive consolidation in the mobility industry. It wouldn’t surprise me if in ten years there was one German automotive company, one or two American companies, one or two Japanese and a couple of Chinese.”

To see how all of this exuberance about China fits with reality, we checked in with Jochen Siebert, founder and managing director of JSC Automotive, a 20-person consultancy that specializes in the Chinese automotive market.

The market for electric vehicles in China has grown rapidly. In 2018, the Chinese market alone accounted for two-thirds of all of the full-electric vehicles sold globally. The market is supported almost entirely by subsidies, by special
licensing rights you get when you buy a car in Beijing or Shanghai, and by purchases for government fleets. “Take the subsidies away and nobody will buy these cars,” declared Mr. Siebert. The subsidies were supposed to run through 2020, but earlier this year China decided to cut the subsidies by 50%, starting at the end of June. As a result, in July the EV market contracted by 5%, in August it was off by 15%. In October it was reported that EV subsidies would be entirely phased out by 2021.

According to Mr. Siebert, half of the 1.2 million electric vehicles sold in China in 2018 were purchased by fleets. “So you replace the taxis in Beijing with battery taxis. Why would you do that? Because the fleet belongs to the government of Beijing as does BAIC (Beijing Automotive), which also makes very cheap electric cars. Beijing would buy those from BAIC and push them to the taxi fleet they own, and get a few thousand dollars from the central government for each one.”

But the electric taxis are so cheap they can’t be driven in the winter because it’s too cold and they don’t have battery heating systems that work. “In the winter they have to bring out the old gasoline taxis,” Mr. Siebert added.

**China’s Changing EV Regulations**

This year, not only did China cut the subsidies for EVs, it also changed policies to affect the sale of vehicles with internal combustion engines. China set a goal that electric vehicles should account for roughly 20% of car sales by 2025. With the focus on EVs, carmakers weren’t doing enough to improve the efficiency of their internal combustion engine vehicles. This summer China released a modified version of its new energy vehicle (NEV) policy that will give carmakers credits for selling “low fuel consumption vehicles,” including hybrids.

Mr. Siebert: “China might count methanol vehicles as NEVs. Methanol can be extracted from coal. Is it good for the environment? No. People ask why China does this. The environment is only the second-most-important issue for China. The most important issue is energy independence. China realized if we push the OEMs too hard on EVs, they will be less focused on ICES. We have to force them to make ICES more efficient.” Globally, China ranks third in coal reserves.

JSC Automotive annually publishes its “China New Energy Vehicle Report,” which features a market forecast for hybrids, plug-in hybrids and electric vehicles for the next five years, among much else.
JSC Downplays China’s AV Prominence
Mr. Siebert isn’t so sure that China will be the first country to emerge with indigenous autonomous vehicle technology. “China will have 20 different kinds of norms and standards. You will have a Shanghai standard, a Beijing standard—that will make it very difficult for suppliers.” China is far behind on lidar, far behind on artificial intelligence, computing platforms, and system integration and validation.

In China’s master plan for global dominance in AI, the Chinese government has designated Baidu for autonomous driving development. But Mr. Siebert is dismissive of Baidu. “They are not profitable in their core search business. Their Apollo [software stack for self-driving vehicles] is interesting but I don’t think it is anywhere close to what can be done outside of China, in a freer market.” ◆
The Company Profile: Hella KGaA Hueck & Co.

**Thumb Sketch**

*Hella's 2019 fiscal year ended on May 31, 2019.*

**Headquarters:** Lippstadt, Germany; [www.hella.com](http://www.hella.com)

**FY 2019 Sales:** €6,990 million  
**R&D:** 8.8% of sales  
**Financial Expenses:** 0.98%  
**Capital Expenditures:** 7.9% of sales  
**EBIT Margin:** 11.6%*  
**Working Capital:** €1,624 million*  
**Non-Current Financial Liabilities:** €790 million*  
**Equity:** €2,982 million*  
**Market Cap:** €4.776 billion as of September 26, 2019

**Employees:** 38,845 at FY 2019 year end; 7,768 work in R&D  
**Sales per Employee:** €179,946  
**Major Products:** Headlamps, battery sensors, DC-to-DC converters, 24 GHz radar  
**Major Customers:** VW Group, GM, Mercedes, BMW and others

*As of August 21, 2019

**Background**

The company was founded in 1899 as Westfälische Metall Industrie in Lippstadt, Germany, where Hella headquarters are still located. The first factory specialized in the production of lanterns, headlamps, horns and fittings for bicycles, carriages and automobiles. In 1908 the founder trademarked the name Hella for an acetylene headlamp that incorporated lenses and mirrors. In 1923 the
The majority of the company was acquired by the Hueck family.

Hella was restructured as a KGaA (partnership limited by shares) in 2003, which gave the company access to capital markets. The Hueck and Röpke families hold 60% of shares today through a share pooling agreement that will continue at least until 2024. Forty percent of shares are free float.

Hella’s balance sheet is strong. The company has little debt, with an equity ratio of 46.3%.

The company reports in three business segments: Automotive, Special Applications and Aftermarket. Within the Automotive business segment, which accounts for 82% of revenue, are two divisions, Lighting and Electronics. Two new electronics plants came on line in the past year, one in Lithuania to serve European customers, and one in India.

**Product Strategy**

Hella is focusing its product development strategy on two key applications: ADAS/autonomous driving and electrification. In the mid- to long-term, from fiscal 2020 forward, the company plans to shift its product portfolio toward software and electronics content. Hella will consider possible acquisitions in fiscal 2020 or 2021, with an eye toward ongoing businesses that demonstrate technology leadership.

**ADAS**

In Hella’s view, self-driving vehicles won’t begin to substantially penetrate its market until 2030, but the company sees opportunities before then as demand for ADAS capability builds. In Hella’s 2017/2018 annual report, Dr. Rolf Breidenbach, president and CEO, suggested that the share of vehicles with simple to moderately complex driving functions will quickly increase. By 2025 two-thirds of vehicles worldwide will have such systems. Hella is developing radar sensors, camera software and a piezoelectric sensor.

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◆ Radar
Hella is among the global leaders in 24 GHz radar sensors, which are used primarily for blind spot detection. Hella has been shipping 24 GHz radar since 2006 and said in 2018 that it was the world market leader with 20 million units shipped. While the market for 24 GHz radar will by 2020 begin to fade in favor of 77/79 GHz radar, Hella claimed in February that its booked business will “more than triple Hella’s volume.”

Hella has been developing 77/79 GHz radar sensors, which are smaller and better performing than 24 GHz radar. An order, probably from Volkswagen, for 77/79 GHz technology for a low-cost corner radar application should start shipping in 2021. Hella’s 77/79 radar can measure distances during automated parking maneuvers. It can also be used to fulfill NCAP automatic emergency braking requirements.

Hella is a late arrival to the 77/79 GHz radar market and must now play catchup with the leading tier-one system suppliers Aptiv, Bosch, Continental and Denso. Hella sees itself not as a system supplier but as a component and subsystem supplier.

◆ Front Camera Software
In January 2018, Hella’s Berlin-based subsidiary, Hella Aglaia Mobile Vision, introduced its platform for front-camera-based driver assistance systems. Functions include headlamp control and lane, traffic sign, pedestrian and object detection. Hella Aglaia has been working with Renesas and Ambarella to pair its software with those companies’ vision processors. Hella camera solutions that fulfill Euro NCAP requirements can be run on platforms from four semiconductor partners.

With its front camera software, Hella competes with the Mobileye division of Intel. Mobileye pioneered camera image processing and now controls a majority of the market. To distinguish itself from Mobileye, Hella describes its software solutions as open and flexible, allowing customers to assemble systems using parts or all of what Hella is offering. In the past Mobileye’s software was “black-boxed” inside their EyeQ SoCs. Customers weren’t allowed to contribute any of their own software or software from third parties to the EyeQ solution. With EyeQ5 and EyeQ6, that is no longer Mobileye’s policy. The latest SDK lets customers develop their own code and their own algorithms that can run as part of the system.

Thus far Hella has received production orders for L2+ camera software from a European OEM and for L1 camera software from a Chinese OEM.
Structure-Borne Sound Sensor
First introduced in 2017, Hella’s SHAKE (structural health and knock emission) structure-borne piezoelectric sound sensor can detect even slight collisions that can occur as a self-driving vehicle parks itself. If the vehicle’s body or bumper comes in contact with an obstacle the vehicle can be brought to a stop. The SHAKE sensor can also detect the unique vibrations that occur between the tires and a wet road, to warn of aquaplaning, for example, and possibly prevent an accident. Hella is in series production with a premium OEM for this moisture sensing application.

Electrification
Forced by environmental regulations in Europe, China and Japan, carmakers have begun to electrify their fleets in order to meet stricter CO2 emissions targets. According to Strategy Analytics, by 2026, 32% of new vehicle production will feature electrified powertrains and 40% of these will be mild hybrids based on 48-volt systems. China is expected to lead the world in the transition to electric powertrains. Hella has positioned its product portfolio and market development efforts to take advantage of these trends.

Despite economic headwinds, one energy-management product line currently in high demand at Hella is its portfolio of DC-to-DC converters. The company ships 1.5 million units annually. Converters range in size from 100 watts to 3 kilowatts.

Hella has been producing battery sensors since 2000. The company now wants to shift from its role solely as component supplier to a supplier of electrification subsystems. Today 560 employees work in energy management R&D at Hella, a number that will nearly double by FY 2024.

More than 85 developers were engaged earlier this year with 20 Chinese customers working on energy management solutions at Hella’s development facility in Nanjing.

New Electrification Products
Dual-Voltage Battery Management System
Designed for compact and mid-sized vehicles, Hella’s dual-voltage lithium-ion batteries can be switched to 12 or 48 volts, as required: 12 volts for operation of the vehicle’s electrical system and 48 volts for energy recovery. The dual-voltage battery replaces the lead-acid battery and takes up no more space than a conventional 12-volt.
According to Dr. Breidenbach, speaking during Hella’s Q1 2020 earnings call, “We are currently in predevelopment activities with some customers, and the feedback is great. We are optimistic that we can launch this technology in 2023.”

◆ **PowerPack 48 Volt**

Designed to meet mild-hybrid requirements in mid-sized and luxury class vehicles, the PowerPack combines a 48-volt lithium-ion battery and DC-DC converter in a water-cooled housing. The unit complements the vehicle’s 12-volt lead acid battery. Hella has not yet received an order for the PowerPack 48 Volt.

**Lighting**

This is a challenging time for carmakers. Car sales are slipping while carmakers are pouring money into electric and autonomous vehicle development. As a result, carmakers are less interested in projects aimed at creating distinction with new and expensive headlamp features. New lighting projects in Europe and China have been delayed by some OEMs.

Nearly 40% of Hella’s lighting sales come from its advanced (matrix) headlamps that feature dynamic lighting functions. But the market for those highly innovative lighting products is expected to decline in favor of standard solutions, says the company. Unit prices will slip as carmakers shift to lower-value-add solutions. While car sales were down 4% in Hella’s first quarter, lighting sales were down 7% in the quarter compared with the prior year.

Hella has been developing its next-generation, high-definition, solid-state light sources (HDSSL) for headlamps that feature a matrix of 15,000 LED pixels that can be individually and intelligently controlled. With the higher number of pixels and the enlarged light-emitting surface, the headlamps are able to project more precise light patterns on the road, for example optical lane markers.
Hella won an order from a “huge” German carmaker for HDSSL headlamps, with production beginning in calendar year 2022. In February, Hella said that it will selectively invest in HD lighting technology and sees no need to offer a fully fleshed out portfolio in the short term.

With the majority of its automotive sales coming from lighting products, Hella is facing massive disruptions starting in 2030 as the automotive industry transitions to vehicles that drive themselves. In the distant future, Hella’s existing lighting portfolio will face declining sales and eventual obsolescence.

Automotive lighting will not go away but the uses cases for it will change dramatically and this will demand substantial R&D and capital investments. Illumination will need to serve the vehicle’s cameras, not human drivers. Lighting will be needed to allow an autonomous vehicle to communicate with other road users. For example, display lighting will be needed to signal to pedestrians at road crossings that they are seen and that it is safe to cross. Robotaxis will need displays that tell waiting customers that this taxi is for them. Interior lighting will have to be flexible depending on how passengers choose to spend their travel time, whether they are working, reading, watching a display screen, or in conversation.

Headwinds
The outlook for global light vehicle production is characterized by uncertainties and a continuous downward trend. While further revisions are possible, for now Hella is expecting light vehicle production over its 2020 fiscal year to decline by 6%. The market’s weakness has already negatively impacted Hella. The company’s total currency and portfolio-adjusted sales declined by 5.5% in Q1 of fiscal 2020. Hella’s Automotive segment was down by 3.6%. Light vehicle production was especially weak in Europe and China. Moody’s gives Hella a credit rating of Baa1 (lower medium grade) but recently changed its outlook from stable to negative, given the company’s strong dependence on the automotive industry.
Hella has been serving the Chinese market for more than 25 years, and China is presently home to 1,300 Hella developers. According to a Hella press release from April 2019, “Hella is focusing on China. China remains one of the key automotive markets for Hella.” Though lately, China’s near- to mid-term automotive prospects have deteriorated. In the Q1 2020 earnings call last month, Dr. Breidenbach reported that the Chinese automotive market is cooling down and is not expected to soon recover. He said that his partners in China are “not optimistic” and believe the Chinese market will continue to “shrink” in the second half of the year, at least. “The Chinese market is very weak,” he said.

Indeed, that is the assessment of Jochen Siebert, founder and managing director of JSC Automotive, a consultancy that has been closely watching the Chinese automotive market for 12 years. Mr. Siebert expects Chinese automotive production to decline by 5% this year and trend neither up nor down for the next five years or so.

Further, Mr. Siebert is not at all sanguine about the prospects for the xEV market in China, a market that Hella has engaged with the expectation that China will reach its goal to become a global leader in electrification. “Analysts have gotten [confused] by the swift growth in volumes of electric vehicles in China. But we said from the start, all or most of these vehicles are bought because of subsidies and because of special licensing rights you get when you buy a car in Beijing and Shanghai. Take this away and nobody will buy these cars. We see that happening now. … The EV market is now contracting. In July it was minus 5%, in August minus 15%.”

Given the negative pressure on revenues Hella is now devoted to strictly managing its costs in all dimensions including material, direct and indirect personnel, as well as R&D spending. Already over the last 12 months Hella has reduced its employees by 2,200.

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Alliances
With investment capital limited in the face of rising R&D costs and slowing sales growth, Hella will increasingly rely on partners to help expand its markets and share product development investments.

Development Partnership with ZF
In June 2017, Hella and ZF formed a strategic partnership to cooperate in the development of camera and radar sensors aimed at ADAS and autonomous driving. ZF is the system supplier with Hella contributing radar sensors and camera imaging software. The first joint solution is expected to go into production in the second half of 2020.

Interior Lighting Partnership with Faurecia
Hella and Faurecia will work together to develop innovative lighting solutions for the future. Faurecia will be the system integrator. Hella will supply interior lighting products.

Car Body Lighting Partnership with Plastic Omnium
The two companies will work together to integrate lighting components into the vehicle body, starting with the front and rear areas of the vehicle. Plastic Omnium will contribute its plastic processing expertise and handle system integration. Hella will supply the lighting components.

Battery Management Cooperation with BHAP and Farasis Energy
Hella will work with BHAP, part of the Chinese automotive group BAIC, and the Chinese battery specialist Farasis to develop, produce and distribute battery management systems for 12-, 48- and high-voltage applications. Hella will contribute its hardware and software development expertise. Farasis is contributing its battery cell production know-how. BHAP will ensure market access within the BAIC Group.

Lidar Partnership with AEye
In January 2019, AEye, one of some 40 developers of automotive lidar technology, entered a joint development and manufacturing agreement with Hella to deliver lidar sensors to the ADAS market. According to the Hella press release, AEye is a “world leader in artificial perception systems,” and creator of a solid-state lidar scanner, first demonstrated in 2013. AEye is based in California; investors include Hella Ventures, LG Electronics, Subaru-SBI, Intel Capital and others.
Hella’s Major Automotive Products

**Electronics**
- Body electronics
- Radio transmitter keys and ID transmitters
- Body control modules
- Memory seat modules
- Passive entry/go systems
  - Comfort ECUs
  - Door handle modules
- Antennas
- Remote keys
- Trailer tow modules
- Interior control units

**Actuators**
- Vacuum pumps
- Relays
- Engine compartment actuators
- Body actuators
- Cleaning systems
  - Washer fluid pumps
  - Telescopic nozzles
  - Hoses
- Horns

**Sensors**
- Rain/light/climate sensors
- Climate sensors
- Medium sensors
  - Packaged ultrasonic level sensors
  - Oil pressure and temperature sensors
  - PULS + C
- Position sensors
  - Vehicle level

**Energy Management**
- Throttle position
- Exhaust gas recirculation
- Transmission range
- Motor position
- Steering sensors
  - Steering torque and angle sensors
  - Steering torque sensors
  - Motor position sensors
- Accelerator pedal sensors

**Li-ion battery electronics**
- Battery management units
- Cell monitoring units
- Insulation monitoring units
- High-voltage current sensors

**DC-DC converters**
- Driver Assistance
  - 24 GHz radar
  - 77 GHz radar (in development)
- Steering control modules

**Lighting**
- Headlamps
- Interior lighting
- Lighting electronics
- Multi-function lamps
- Car body lighting

Hella’s Global Electronics Production Footprint – 15 Plants

Germany (3): Hamm, Recklinghausen, Bremen
Romania (2): Timisoara, Arad
Lithuania (1): Kaunas (SOP: 2018)
Mexico (2): San Jose Iturbie, Apaseo el Grande (SOP 2018)
USA (1): Flora, Illinois
Brazil (1): Indaiatuba (SOP 2016)
China (3): Shanghai (extension in 2019), Xiamen (two sites)
India (2): Dhankot, Gujarat (SOP: 2019)

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Stanford B-School Lecturer and Venture Capitalist Robert Siegel on Navigating Auto Industry Disruption

Rob Siegel likes to say that he has two full time jobs. He is a full time member of the Stanford faculty in the Graduate School of Business. He is also a partner at XSeed Capital, an early stage investment firm specializing in companies that create innovations, typically in software, computer science and other IT disciplines. I met Mr. Siegel at The Autonomous Event in Vienna, a conference designed to build support for coming up with a common platform for autonomous vehicle safety. Mr. Siegel is a member of the supervisory board of TTTech Auto, the Event’s lead sponsor. He also serves on the board of SmartDrive Systems, and is a member of the industry advisory boards for Here Technologies and Tulco. At fifty-one years old, he has the energy and enthusiasm of a much younger man. He works eighty hours a week and loves what he does.

Collaborating on AV Safety
The Autonomous Event he moderated seemed to be building a consensus, among the German carmakers at least, that autonomous vehicle developers should not compete on safety. They should instead collaborate to develop a common safety platform that is demonstrably safer than human-driven vehicles.

The question we should ask, according to Mr. Siegel is, “Will safety be a differentiator in autonomous vehicles, and at what level? The information about how to make an AV safe will, I think, face strong regulation—at a level unlike we have ever seen in the automobile industry and the mobility industry. I think it will look more like the airline industry. The more things get automated, the more governments on a global basis will look to ensure that their citizens are safe. I believe they will force regulation on safety and force sharing a lot of the information that makes AVs safe. The minimum bar will be raised substantively for all parties.”

Some AV developers will try to differentiate with their software stack or sensors, or perhaps with the way they test on the road or in simulation.

“I think companies will try,” said Mr. Siegel. “But at the Autonomous you heard several speakers talk about the amount of capital that is required to make this happen. This is the world’s hardest engineering problem ever created.
With all of the simulation that is going into the systems, the amount of computer processing in real time, etc., I think that every company is realizing they can’t do it on their own. Companies have to work together to make these vehicles as safe as possible. So I tend to think you are going to see much more collaboration than not. I think everyone is realizing this is kind of a prerequisite now to be successful.”

Mr. Siegel encourages companies to figure out their strongest points of competitive advantage, but to collaborate more broadly on safety. “No company will be able to do it completely on their own,” he emphasized. “That would be an absolute train wreck.”

**Waymo**

Waymo is the putative world leader in automotive vehicle development. And while Waymo has purchased vehicles from FCA and JLR on which to install Waymo self-driving systems, and signed deals with Nissan and Renault to work on issues surrounding self-driving car technology, there is nothing to indicate that Waymo would not choose to compete on safety.

I asked Mr. Siegel to speculate on how Waymo might seek returns on its investments in self-driving technology.

“They have shown no indication that they want to make automobiles. They will probably want to license the software to manufacturers of automobiles. The [Google] Android team can give software away for free, open source, because Google largely makes its money on ads. Can Waymo pull off that same business model? … They have the most data and they are ahead in a lot of issues around automated driving. How that gets monetized will require collaboration with other companies.”

**Top Disrupters**

Among the disrupters, who besides Waymo is showing the most promise?

“I’d highlight a few,” Mr. Siegel offered. “I think Cruise, given its alliances and backing and what it has accomplished so far, clearly looks like it might have a spot in the ecosystem.” Cruise is owned by GM, and Honda is a major investor, after having walked away from a deal with Waymo.

“I think Aurora looks particularly interesting, because of the quality of that leadership team and their technical reputation. We hear a lot about them in the Valley. They seem to have both the technological side and, at this point, a business model that seems to work for multiple suppliers in the stack.”
Aurora’s CEO is Chris Urmson, a founding member of Google’s self-driving project (now Waymo). Aurora’s chief product officer, Sterling Anderson, led Tesla’s Autopilot effort. Amazon is an investor.

“Another company I hear about, but a little less, is Argo.AI. It is early for Argo, but that is one of the ones we are seeing and hearing about here in the Valley.” Ford and Volkswagen own a substantial majority of Argo.AI.

“And don’t forget Tesla. They are not taking a collaborative approach, but betting against Elon Musk is historically not a good thing to do.”

Mr. Siegel predicts that in ten years the world of mobility is going to look radically different from what it looks like now, and ten years after that will be even more different. “I can’t wait to see how it plays out.”

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