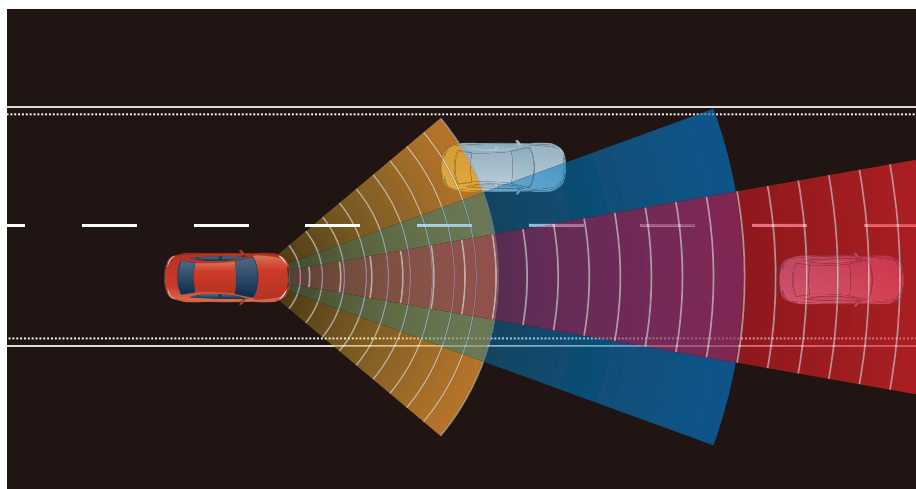


# Q&A WITH JOHN WARANIAK

## ADAS and Forward-Collision Avoidance Systems

By Mike Imlay



■ Forward-collision avoidance systems—especially passive systems such as forward-collision warning—comprise just one of the more important new technologies in the emerging aftermarket category of “safety performance.”

**SN:** You mentioned that active systems can also include AEB. Can you explain?

**JW:** AEB systems combine external sensors, the ECU and the vehicle’s braking system to detect and automatically intervene to avoid or mitigate a crash. Typically, those systems are integrated with FCW to alert the driver, then intervene if no action is taken to avoid impact. The National Highway Traffic Safety Administration (NHTSA) has adopted a definition of AEB that includes two functions: dynamic brake support and crash-imminent braking. The latter is what most people think of as AEB. The former activates only if the driver fails to apply the brakes hard enough to avoid a collision.

AEB can be very effective in common crash scenarios where a lead vehicle brakes hard in a straight line and a tailing driver is distracted or otherwise unable to respond appropriately. Vehicles with a full collision avoidance system, including FCW and AEB, are 50% less likely to cause a rear-end crash. That is a substantial improvement over the estimated 27% rear-end crash reduction rate for vehicles with FCW alone. However, SEMA research has yet to identify any current aftermarket AEB offerings. It’s likely that aftermarket AEB systems will be too cost-prohibitive and complex to integrate for the foreseeable future.

**SN:** What is the current regulatory and/or liability climate for FCW systems?

**JW:** There are no existing or proposed mandates or safety regulations for FCW in

**W**hile identifying multiple growth opportunities for the specialty-equipment industry, the recently released “SEMA Advanced Vehicle Technology Opportunities Report” (see p. 124) predicts specific growth potential in the area of forward-collision warning (FCW) systems. To better understand this advanced driver assistance (ADAS) technology, SEMA News turned to SEMA Vice President of Vehicle Technology John Waraniak.

**SEMA News:** Let’s start with a quick overview of FCW systems and how they fit into the overall ADAS picture.

**SN:** How do those systems work?

**JW:** Nearly every new vehicle on the road today has advanced safety performance features. You may already know some of those ADAS products and technologies and maybe not even realize others that are now standard or optional equipment.

**JW:** They scan the road ahead using sensors, cameras and radar located in the vehicle’s forward area. While there are many variations, all FCW systems include three basic technology components: first, the sensors (radar, camera or a combination of those); second, an electronic control unit (ECU) and software; and third, a driver interface providing an audible, visual, haptic feedback, or a combination of those, to alert the driver.

Forward-collision avoidance systems monitor the driving environment for obstacles that may impose a crash risk. If a risk is detected, they’re designed to alert you so that you can brake or steer away in time. Passive FCW systems alone will not automatically brake for you. More advanced safety systems integrate passive FCW warnings with active automated emergency braking (AEB) to apply the brakes for you.

Alerts often vary in intensity based on the perceived crash risk. Future FCW combined with AEB systems may also automatically engage the steering system to provide integrated emergency intervention if a straight-line stop won’t avoid a collision. Next-generation FCW systems will also include lidar sensors to enhance the capabilities of cameras and radars.

the United States. Aftermarket FCW offerings would seem likely to avoid regulatory scrutiny, but such systems would fall under NHTSA's broad recall authority if found defective. NHTSA evaluates FCW as part of the New Car Assessment Program (NCAP). The NCAP confirms if systems meet minimal requirements without analyzing system effectiveness. NCAP information is provided to consumers but has no implications for regulatory enforcement.

FCW systems impose relatively little liability concern for the aftermarket manufacturer and/or installer. The driver remains in complete control of the vehicle and is responsible for its performance, regardless of any passive warnings provided by the system. Product liability can be further mitigated through explanations of system limitations and providing the option of adjusting system sensitivity and/or allowing for complete deactivation.

**SN:** *And, for reference, how about systems that may include AEB?*

**JW:** AEB is an active safety performance extension of FCW. Like FCW, it's only effective in cases where the system can accurately assess crash risk and respond appropriately. The challenge is that crash-risk assessment and driving environment can be very dynamic and complex. In addition to correctly analyzing crash-risk scenarios, it's a challenge to activate braking in a manner appropriate to the vehicle's dynamics.

Regardless, NHTSA has formerly denied a petition for rulemaking concerning AEB. While NHTSA recognizes AEB's safety value, the agency has decided to promote adoption by including it in the NCAP program and coordinating with automakers to work toward voluntary standardization.

Twenty automakers comprising nearly the entire U.S. market have pledged to make AEB standard by 2022. Today, 92% of Toyota and Lexus vehicles sold in the United States already have AEB as standard equipment. Many of those AEB systems have integrated FCW.

One regulatory issue that SEMA members do need to understand is that any modifications to the vehicle's suspension or braking system must not take the vehicle out of compliance with FMVSS126 regarding electronic stability control.

**SN:** *How simple are FCW systems to install? Do they require special tooling or knowhow?*

**JW:** FCW components have the potential for bolt-on installation without special tools or detailed integration with vehicle electronic systems. Simple aftermarket installation or even DIY kits are possible. The primary challenge is likely to be the know-how to program the system's sensitivity to suit the driver.

**SN:** *So from a business angle, the making, selling and/or installing of FCW systems makes a lot of sense.*

**JW:** Interviews with OEMs and suppliers conducted during SEMA's ADAS research project suggested that FCW systems have significant aftermarket growth potential. Forward-collision avoidance systems have an increasingly strong presence at the OEM level. However, there are still more than 200 million vehicles that could potentially utilize aftermarket FCW products as upgrades or retrofits.

OEM penetration, a leading indicator of potential aftermarket ADAS adoption, is currently valued at \$7 billion to \$8 billion in the United States. Aftermarket solutions are forecasted to grow due to their lower costs and consumer desire for safety-performance systems on older vehicles. OEM-level FCW systems, often bundled with AEB systems to meet the 2022 standardization target, can cost approximately \$2,500. Aftermarket FCW systems average about \$800.

The Highway Loss Data Institute estimates that 4% of registered vehicles in the United States had FCW systems in 2016. That number is expected to top 20% by 2021. So even with OEMs adding FCW systems as standard equipment or options, there's still significant room for the aftermarket. In fact, SEMA forecasts the dollar value of FCW systems to grow at 14% per year through 2021. Currently, annual sales of aftermarket FCW products are estimated to be around 60,000 units, representing more than \$50 million in revenue.

FCW systems must effectively recognize and alert the driver of a crash risk. With current technology, it's impossible to warn of every crash risk scenario without also triggering false-positive warnings. With respect to consumers, frequent false positives are

a nuisance that can lead many drivers to disable their systems. Aftermarket systems could gain market share by offering more consumer-friendly features such as the ability to customize or adjust to personal preferences and driving styles. In other words, new and increasingly innovative, consumer-friendly aftermarket FCW products could generate significant sales.

As for retail and installation channels, custom and collision-repair shops could be lucrative ways for SEMA manufacturers to reach new consumers. In fact, SEMA is working with the Mobile Electronics Association and InstallerNet to help specialty manufacturers and service providers overcome their barriers to entry in bringing new ADAS products to market.

**SN:** *How can the specialty-equipment industry best present FCW to aftermarket consumers?*

**JW:** Consumers are increasingly demanding safety performance. As more automakers introduce and market suites of ADAS technologies, such as Ford with its new Co-Pilot360 and Toyota with its Toyota Safety Sense, more and more consumers will want to add FCW to their vehicles if they were not equipped at the factory. The Insurance Institute for Highway Safety estimates that FCW can reduce rear-end crash rates by 27%, and aftermarket FCW systems pose relatively little liability concern.

SEMA members can proactively drive "increased safety performance for all" by advocating for FCW systems. We can emphasize their safety implications and helpfulness to drivers who have trouble reacting to unexpected road situations or who are otherwise distracted. We can also support the Vision Zero Automotive Network movement, whose mission is to save 10,000 lives with currently available aftermarket safety technologies. Vision Zero is working with aftermarket ADAS leaders and smart cities across the United States to raise awareness of the safety performance products our industry makes available to vehicle owners. 🚗



■ John Waraniak leads SEMA's vehicle technology programs to connect members with cost-effective product-development and engineering resources, solutions and benefits.