



Bendix® Wingman® Fusion™
The integration of camera, radar, and brakes delivers
a new level of performance for School Buses.

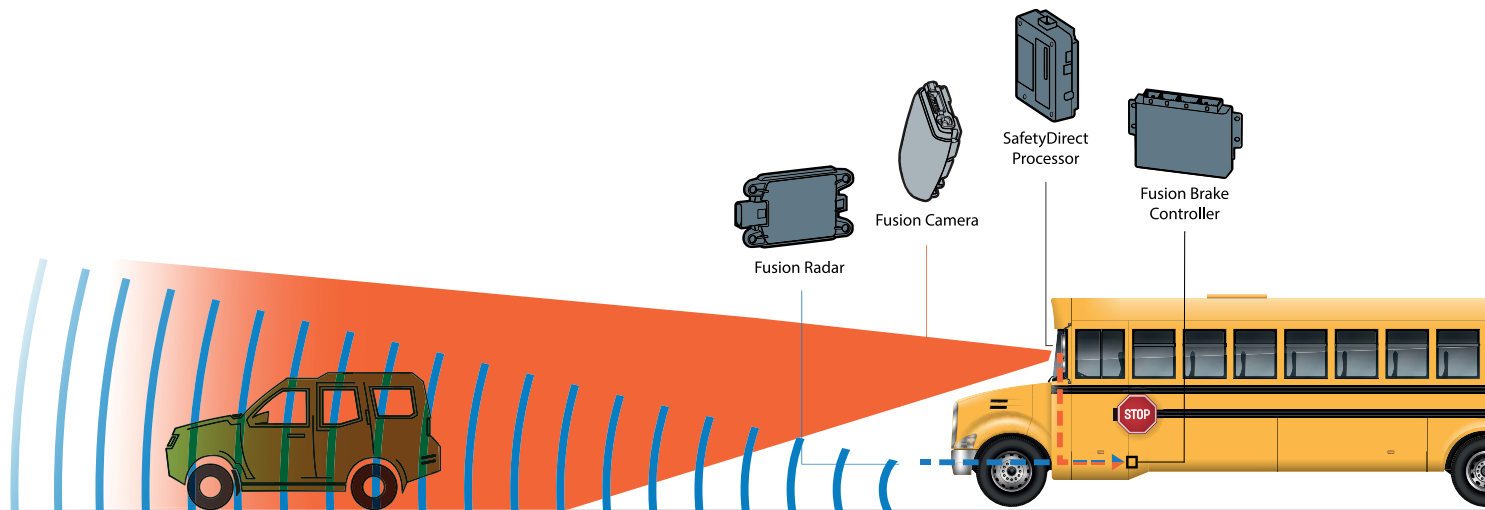


Protect Your Fleet with Our Most
Advanced Safety System Ever



OUR NEW FLAGSHIP DRIVER ASSISTANCE SYSTEM

Bendix® Wingman® Fusion™ integrates next-generation advanced safety technologies (radar, camera, brakes, and SafetyDirect®) into one comprehensive driver assistance system that's more powerful than other safety system technology combinations in the North American school bus marketplace today.



Integrated System

Bendix Wingman Fusion is built on proven technologies from Bendix – technologies including Bendix® ESP® Electronic Stability Program full-stability system, Bendix® Wingman® Advanced™ – A Collision Mitigation Technology, and AutoVue® Lane Departure Warning System from Bendix CVS. Wingman Fusion gathers input from radar, video, and the brake system to create a highly detailed and accurate data picture. Data from its next-generation radar, camera, and brake system are fused to each other – constantly gathering, sharing, and confirming information.



Other products may offer similar independent component technologies, but without the true integration – and unique new safety capabilities – that makes Wingman® Fusion™ a breakthrough, they simply can't offer the same level of performance.

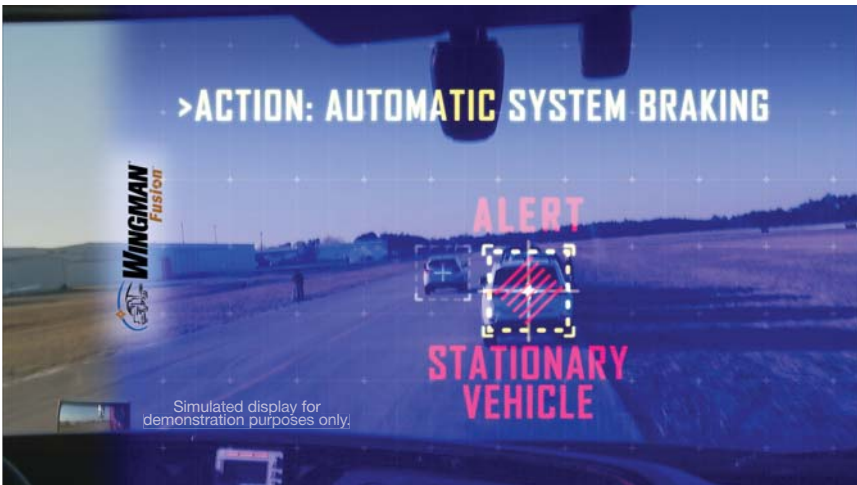


Figure A

Bendix Wingman Fusion integrates next-generation systems – the radar, camera, the vehicle's brakes, plus the SafetyDirect® web portal – to help provide enhanced safety for today's North American school buses.

The real benefit of Wingman Fusion's approach can be fully understood when combining its complementary technologies. Not only does the system use multiple sensors to confirm objects, but the sensors use different technologies. So, when they agree, the result is even further reduction of false alerts or activations. This combination of complementary sensors makes possible much of Wingman Fusion's advanced functionality.

Powerful New Features for Advanced Safety

Bendix® Wingman® Fusion’s technical advances and deep integration delivers a powerful combination of robust features including Stationary Vehicle Braking and Overspeed Alert & Action.

Stationary Vehicle Braking (SVB) is possible because the system uses BOTH radar and camera data to confirm the vehicle ahead. With an activation speed above 15 mph, here is how this dynamic feature works: When the large, stationary, metallic object in a vehicle’s lane of travel is definitively identified as a licensed motorized vehicle, the driver is notified up to 3.5 seconds before impact. If the driver does not take action to address the potential impact that caused the alert, Wingman Fusion can automatically engage the brakes to assist the driver in reducing the severity of, or potentially avoiding, a collision with the stationary vehicle.

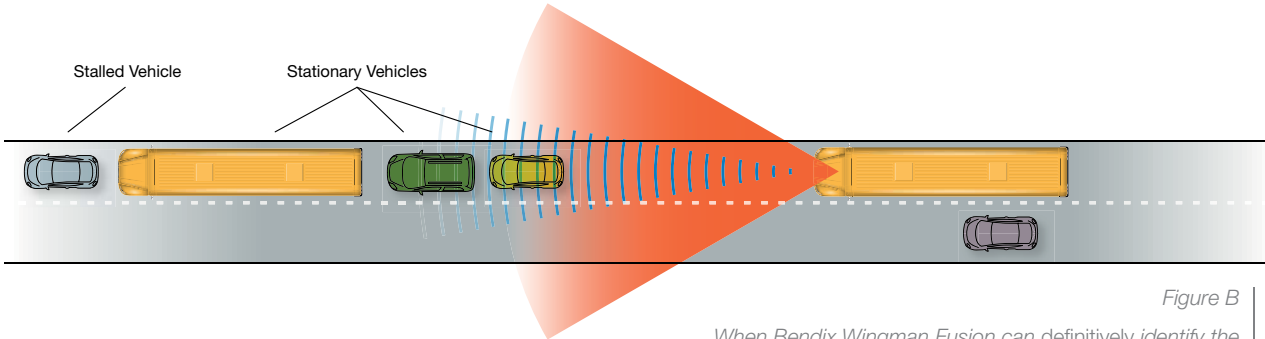


Figure B
When Bendix Wingman Fusion can definitively identify the large, stationary, in-lane, metallic object as a vehicle, the system will alert the driver with up to 3.5 seconds notice. Then, if necessary, it will automatically apply the vehicle’s foundation brakes to help mitigate, or possibly prevent, impact.

If the system cannot definitively identify the stationary object as a licensed motorized vehicle, the driver will get up to 3.0 seconds of alert to address the situation ahead; no automatic braking will be applied. Stationary Vehicle Braking is most useful when approaching a line of stopped traffic or a stalled vehicle that is not immediately recognized by the driver. Without the automatic alert and braking, it may be too late to avoid impact. As always, responsibility for the safe operation of the vehicle remains with the driver at all times.

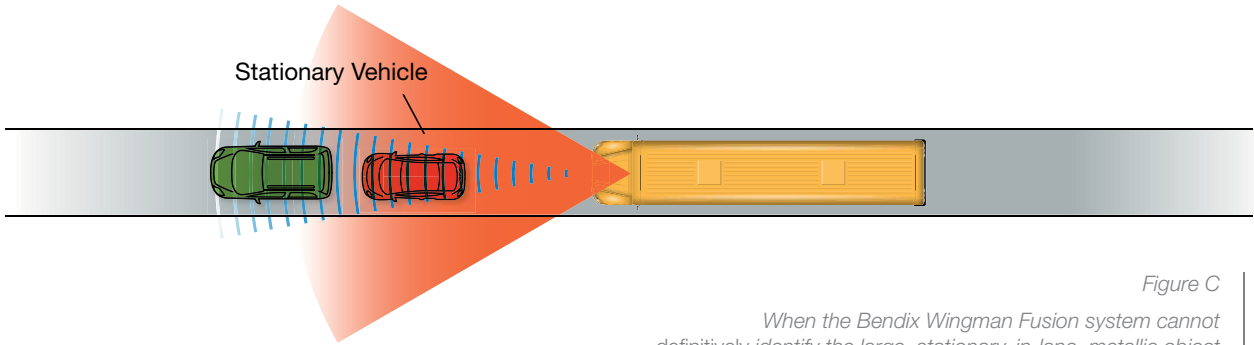


Figure C
When the Bendix Wingman Fusion system cannot definitively identify the large, stationary, in-lane, metallic object as a vehicle – such as a sideways car or a non-vehicle – the system will issue an alert only, up to 3.0 seconds from the potential impact.

Overspeed Alert & Action – an exclusive Bendix feature – uses Wingman Fusion’s camera to read most roadside speed limit signs. On the road, when traveling above 20 mph, the system compares the posted speed limit with the vehicle’s speed and provides two levels of alert and/or intervention to assist the driver.

For a **Level One** intervention – initially set at +5 mph over the posted speed limit – the system provides an audible warning to the driver, notifying them to slow down. If the vehicle is traveling at 10 mph or more over the posted speed limit – known as a **Level Two** intervention – the system provides an alert and then a 1- second dethrottle of the engine to get the driver’s attention. (Note: The system does **not** apply the brakes to reduce speed).

In addition, for Level Two, a severe event notification is sent wirelessly through SafetyDirect® – if your fleet is a subscriber – to be analyzed by a fleet’s back office for possible training. Both Level One and Level Two speed thresholds are customizable by the fleet using Bendix® ACom® diagnostics.



Improved Performance of Existing Safety Features

Enhanced Collision Mitigation

Bendix® Wingman® Fusion™ is also able to enhance – collision mitigation braking. When triggered by a slower moving, or standing, vehicle ahead, Wingman Fusion’s combined video, radar, and brake system generate a faster analysis of the situation. During a potential collision situation, this allows Wingman Fusion to potentially reduce the vehicle’s speed by 40% more than Wingman® Advanced™.

In addition, a backup plan is in place if the camera becomes inoperable due to damage or an active Diagnostic Trouble Code (DTC). If that happens, Wingman Fusion is “smart” enough to revert to Wingman Advanced functionality, including collision mitigation. (See “System Comparison”)

Alert Prioritization

Alerts are also improved. Wingman Fusion’s abundance of input data and powerful computing significantly minimize false alerts. And **Wingman Fusion adds a new feature: alert prioritization**. In the event that multiple system alerts are needed simultaneously, such as lane departure warning and impact alert, Wingman Fusion will arrange them in order of importance and deliver only the most crucial alert to the driver to minimize potential distraction. (Figure D)

Comprehensive Alerts

Following Distance Alerts (FDA) and Lane Departure Warning (LDW)

are also part of Wingman Fusion. Both features alert the driver to potentially hazardous situations. When driving too close to the forward vehicle, the system will sound an alert and display visual graphics to alert the driver to back off. As with Wingman Advanced, when the gap with the forward vehicle is growing, the FDA is silent. The FDA is customizable by the fleet to allow for varying fleet operating environments. In addition, if the vehicle unintentionally departs the lane without the turn signal activated, the system will also sound a lane departure warning. (Figure E) This can be particularly valuable to help the driver mitigate run-off-road accidents or side-swipe crashes usually caused in part by distraction or drowsiness.

These alerts are also part of the “alert prioritization” approach incorporated by Wingman Fusion, intended to reduce driver distraction by sounding only the most critical alert even if multiple alert scenarios are detected.

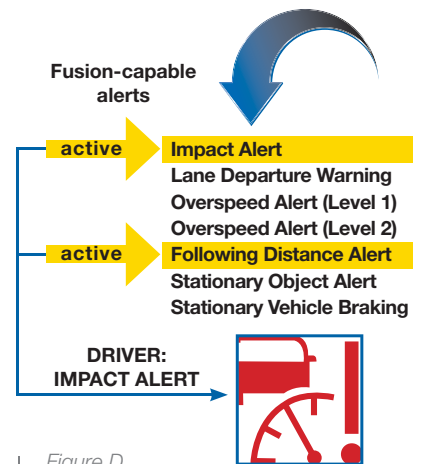


Figure D

To minimize driver distraction – especially common from independent alert systems – Wingman Fusion will sound only the most important alert to the driver. This allows them to focus attention on the most potentially threatening situation.

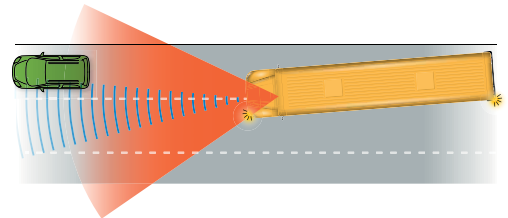


Figure E

Above 37 mph, when an unintended lane departure is detected, the system makes a “rumble strip” sound to alert the driver. The alert is silent when the turn signal is used.

Integration with SafetyDirect®

Like its component systems, Bendix® Wingman® Fusion™ integrates with SafetyDirect®, the user-friendly Web portal that provides fleet operators with data and videos of severe events, along with comprehensive fleet and driver feedback. (Figure F)

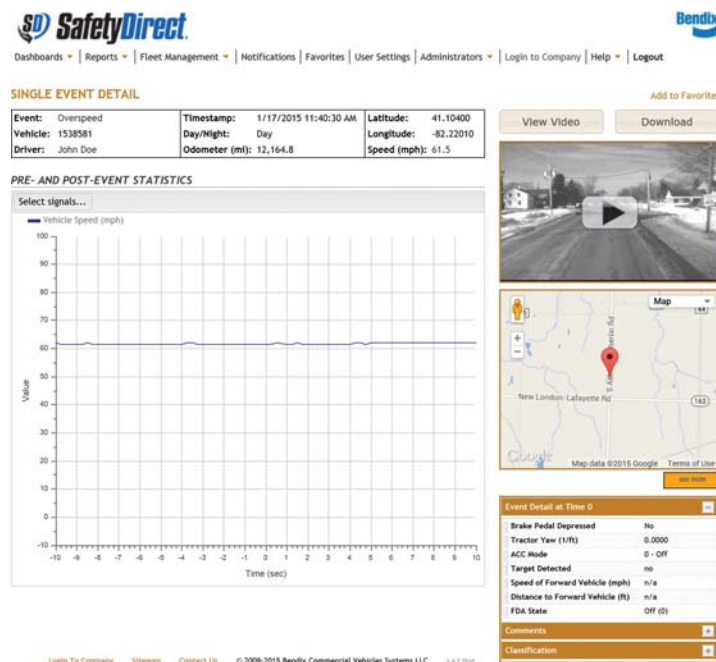
SafetyDirect – an option available to your fleet – wirelessly transmits real-time driver performance data, videos, and event-based information for back office analysis. It's an essential, customizable tool for gleaming actionable information that can improve fleet and driver safety and accelerate return on investment.

Also, the tool now **opens the door for two-way communication with the vehicle**. This means some camera system changes can now be made remotely without having to manually touch the vehicle.

The more information SafetyDirect knows, the more prepared your fleet can be. Wingman Fusion provides more – and more meaningful – information than ever before.

Note: SafetyDirect information is only available with select telematics systems.

Figure F
The graph and video capture shows the Wingman Fusion-equipped vehicle was traveling at 61.5 mph when it passed a 45 mph speed limit sign – fast enough to trigger a Level Two overspeed event that was captured on SafetyDirect for review and analysis.



Bendix safety technologies complement safe driving practices. No school bus safety technology replaces a skilled, alert driver exercising safe driving techniques and proactive, comprehensive driver training. Responsibility for the safe operation of the vehicle remains with the driver at all times.

Near Elimination of False Alerts with Multiple, Complementary Sensors

Today's commercial vehicle safety systems typically rely on an individual radar or camera to identify valid objects and vehicles before issuing an alert or taking action. Bendix® Wingman® Fusion™ takes that one step further by using BOTH the radar and camera together to identify potentially threatening stationary and moving objects. **When these complementary technologies agree on target identification, false alerts or interventions (alerting or braking for objects that aren't valid targets) are significantly minimized.**

The radar locates objects – moving and stationary – within its detection range,

which is about 22 degrees wide and 500 feet long. It is particularly good at detecting the distance, speed, and angle of objects even through difficult-to-see conditions like snow, rain, fog, or smoke. But it generally has more difficulty determining the exact size, lane position, and type of objects it's tracking.

That is where the camera can help. Its viewing angle is wider than the radar (about 42 degrees to better detect cut-ins). It detects objects visually much like a driver's eyes and is highly effective at determining the size, lane position, and critical characteristics of an object – which is why it is a very good complement to the radar.



Integration means multiple sensors are confirming situational data, resulting in more robust decision making for the system as a whole. Fusion is the most powerful and effective Bendix Wingman ever.

Wingman® Fusion™ integrates camera*, radar, and brakes into a comprehensive driver assistance system more powerful than other safety technology combinations in the North American school bus market today.

Bendix® System Comparison

Wingman Fusion, our most advanced safety system yet.

Bendix® Wingman® Advanced™
Bendix® Wingman® Fusion™

Feature

Collision Mitigation (functions whether cruise control is set or not)	
At speeds above 15 mph:	
- Stationary Vehicle Braking can automatically alert the driver up to 3.5 seconds before impact and apply vehicle brakes if the large, stationary, in-lane object is definitively identified as a licensed motorized vehicle	■
- Enhanced Collision Mitigation potentially removes up to twice as much vehicle speed as current collision mitigation systems	■
- Collision Mitigation automatically applies the foundation brakes to mitigate, or potentially prevent, a potential collision with a forward moving vehicle	■ ■
Adaptive Cruise Control with Braking (functions when cruise control is on and speed is set)	
- Reduces throttle, engages engine retarder and applies foundation brakes to help the driver maintain a set following distance behind a forward vehicle	■ ■
Alerts (are always available whether cruise control is engaged or not)	
- Overspeed Alert & Action – with two levels of action, at speeds over 20 mph, Fusion can read speed limit signs and notify the driver and fleet of overspeed travel	■
- Alert Prioritization – only the most critical alert is sounded to the driver to minimize distractions during potentially severe events	■
- Lane Departure Warning – Above 37 mph, a “rumble strip” sound alerts the driver to unintentional lane departure	■
- Following Distance Alert – At speeds over 5 mph, audible and visual alerts let the driver know when they are getting too close to the forward vehicle	■ ■
- Impact Alert – Above 15 mph, audible and visual alerts warn the driver that a collision with the forward vehicle is likely and that they should address the situation immediately	■ ■
- Stationary Object Alert – When a large metallic object(s) may be blocking the lane of travel, above 10 mph, the driver receives audible and visual alerts up to 3.0 seconds before potential impact	■ ■
Integrated with SafetyDirect®	
- Two-way communication channel and Level Two overspeed video capture	■
- Severe event video is captured during collision mitigation event	■ ■
- Compatible with most telematics providers	■ ■
Electronic Stability System	
- The Bendix® ESP® full-stability system helps drivers mitigate rollovers and loss-of-control situations on wet and dry roadways	■ ■

■ ■ Denotes system feature



See for yourself how Wingman Fusion is revolutionizing fleet safety. Visit safertrucks.com/fusion or talk to your account manager today.

*The camera is powered by the Mobileye System-on-Chip EyeQ processor with state-of-the-art-vision algorithms.

Evolution of a Technology

Wingman® Fusion™ is built on the Bendix® ESP® Electronic Stability Program full-stability system. Our ESP, introduced in 2005, was the first full-stability solution widely available for the North American school bus market, addressing both roll and directional stability through additional sensors, and throttle and braking interventions.

Next came the Wingman family, initially launched in 2009 with Bendix® Wingman® ACB – Active Cruise with Braking, then strengthened in 2011 with the

launch of Bendix® Wingman® Advanced™ – A Collision Mitigation Technology.

Each Wingman generation has added significant features over previous versions. Wingman Fusion takes the biggest leap forward yet by combining the best aspects of Bendix's AutoVue® Lane Departure Warning System, Wingman Advanced, and leading-edge safety technology for the first time.



Talk to your Bendix Account Manager.
Call **1-800-AIR-BRAKE** or visit safertrucks.com/fusion.

BW30251CB © 2018 Bendix Commercial Vehicle Systems LLC, a member of the Knorr-Bremse Group • 06/18 • All Rights Reserved

