



U.S. Department
of Transportation

**National Highway
Traffic Safety
Administration**

Memorandum

Subject: Docket Submission of Commitments to Advancing
Automatic Emergency Braking Technology

Date: **MAR 25 2016**

From: Nathaniel Beuse 
Associate Administrator for
Vehicle Safety Research

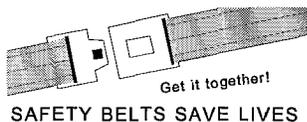
Reply to
Attn. Of: NSR-010

To: Docket Number NHTSA-2015-0101

Thru: Paul A. Hemmersbaugh 
Chief Counsel

Attached for placement in the subject docket are Commitments to Advancing Automatic Emergency Braking Technology. The commitments are from Audi, BMW, FCA US LLC, Ford, General Motors, Honda, Hyundai, Jaguar Land Rover, Kia, Maserati, Mazda, Mercedes-Benz, Mitsubishi Motors, Nissan, Porsche, Subaru, Tesla Motors Inc., Toyota, Volkswagen, and Volvo Car USA.

Attachments





A Commitment to Advancing Automatic Emergency Braking Technology

INTRODUCTION

New and advanced driver assistance systems that are intended to help drivers avoid crashes are quickly entering the motor vehicle marketplace in the United States. These systems utilize outward-looking sensors to gather information about a wide range of possible hazards associated with crashes and employ various interventions — warning, automated braking, automated steering, etc. — to assist drivers. Many crash avoidance systems are typically offered to consumers as optional content on new vehicles.

One category of crash avoidance system is known as Automatic Emergency Braking (AEB). AEB consists of a Forward Collision Warning (FCW) function designed to detect vehicles or objects ahead and alert a driver of an impending collision, coupled with Crash Imminent Braking (CIB), which provides automatic braking when forward-looking sensors indicate a crash is imminent and the driver is not reacting.

Since 2011, a growing body of research suggests that AEB systems have been beneficial in preventing or mitigating some crashes and resulting injuries and property damage. Various studies have found specific crash reductions associated with various implementations of AEB technology on a variety of vehicle types.¹ In light of such studies, on September 11, 2015, the National Highway Traffic Safety Administration (NHTSA) and the Insurance Institute for Highway Safety (IIHS) called upon automakers to convene a working group to discuss how to best advance these technologies in the near term. This document is the product of such discussions and, although the specific reductions may vary from the

¹ See Highway Loss Data Institute Bulletin Vol. 28 No. 6 **Volvo City Safety loss experience — initial results** available at www.iihs.org; Highway Loss Data Institute Bulletin Vol. 32 No. 1 **Volvo City Safety loss experience – a long term update** available at www.iihs.org; Highway Loss Data Institute Bulletin Vol. 32 No. 13 **Volvo City Safety loss experience by vehicle ages** available at www.iihs.org; **Effectiveness of low speed autonomous emergency braking in real-world rear-end crashes**; Fildes, B. et al. *Accident Analysis and Prevention*, August 2015; **Real world performance of City Safety based on Swedish insurance data**; Isaksson-Hellman, I. and Lindman, M. & **AEB real world validation using UK motor insurance claims data**; Doyle, M. et al. in *Proceedings of 2015 Enhanced Safety of Vehicles Conference*; Highway Loss Data Institute Bulletins Vol. 28 No. 21 (Acura), Vol. 29 No. 5 (Volvo) & No. 7 (Mercedes-Benz), Vol. 31 no. 2 (Honda), Vol. 32 Nos. 7, 8, 22, 33 (Honda, Subaru, Mazda, Honda respectively) available at www.iihs.org; **Effectiveness of forward collision warning systems with and without autonomous emergency braking in reducing police-reported crash rates**; Cicchino, J.B., January 2016 available at www.iihs.org; **Effectiveness of Volvo's City Safety low-speed autonomous emergency braking system in reducing police-reported crash rates**; Cicchino, J.B., January 2016 available at www.iihs.org.



results found in the studies footnoted here, there is a general expectation that the fleet wide implementation of the basic performance requirements contained in this document will reduce overall crashes in the relevant crash scenarios.

The AEB systems for which benefits have been documented do have limitations. Many current AEB systems activate only in front-to-rear crash scenarios. They also may have other technological limitations, such as a narrow range of operating speeds or sensors that are adversely affected by weather conditions, dirt or harsh lighting conditions. Additionally, despite extensive testing by automakers, it is possible that customers could experience unique situations resulting in unwarranted interventions by the systems. These occurrences are expected to be infrequent and have a minimal influence on the greater benefits of these systems.

Audi of America **independently** and **voluntarily** commits to make AEB systems a standard feature on substantially all new vehicles (as set forth in this document) by the realization date(s) listed below. Nothing in this document prevents Audi of America from (a) introducing AEB with a higher functionality than that set forth in this document; (b) making AEB standard on all vehicles earlier than the commitment in this document; or (c) using any technology we independently choose to satisfy the AEB performance standards. Moreover, nothing in this document is intended to prevent Audi of America from developing new or different braking technologies in the future. Finally, nothing in this commitment prevents or is intended to prevent: (a) NHTSA or IIHS from pursuing other initiatives to advance the performance of AEB systems or (b) Audi of America meeting its statutory or regulatory obligations under Federal law.

1. DEFINITION OF AEB FUNCTIONALITY

AEB functionality for the purposes of this commitment, along with the associated test procedures, are set forth in this section. We note that AEB technology is evolving, and this commitment will not stand in the way of the development of systems with greater functionality. As such, the level of functionality and test protocols described herein are intended to identify the minimum level of functionality needed to meet the conditions of this commitment, and nothing will prevent Audi of America from offering more advanced technologies.

An AEB system satisfying the terms of this commitment shall have two features, FCW and CIB.



A. Forward Collision Warning

AEB systems conforming to this commitment will include an FCW system that, when tested according to the procedures described in NHTSA's **Forward Collision Warning System Confirmation Test, February 2013**² (the "NHTSA FCW Test"), meets the **Alert Criteria** for tests 2 and 3. Specifically, as set forth in Section 12.3 of the NHTSA FCW Test, "**Test 2 – Subject Vehicle Encounters Decelerating Principal Other Vehicle**" specifies that the FCW alert shall be issued when the time-to-collision (TTC) is at least 2.4 seconds under the conditions set forth in that test. As set forth in Section 12.4 of the NHTSA FCW Test, "**Test 3 – Subject Vehicle Encounters Slower Principal Other Vehicle**" specifies that the FCW alert shall be issued when the time-to-collision (TTC) is at least 2.0 seconds under the conditions set forth in that test.³

B. Crash Imminent Braking

AEB systems conforming to this commitment will also include a CIB system that, when tested according to the procedures described in IIHS's **Autonomous Emergency Braking Test Protocol (Version I), October 2013**⁴, produce speed reductions according to option A or B:

Option A – Average speed reduction across 5 repeated tests that is greater than 10 miles per hour (mph) in either the 12 or 24 mph tests involving a stationary lead vehicle

OR

Option B – Average speed reduction across 5 repeated tests that is greater than 5 mph in both the 12 and 24 mph tests involving a stationary lead vehicle.

2. APPLICABILITY

Audi of America independently and voluntarily commits to make AEB technology conforming to Sections 1.A and 1.B of this document standard equipment in substantially all light-duty vehicles and trucks (i.e., those with a gross vehicle weight rating (GVWR) of 10,000 pounds or less) sold in the United

² Available at www.safercar.gov/staticfiles/safercar/NCAP/FCW_NCAP_Test_Procedure_2-7-2013.pdf

³ The requirements described in section 12.2 of the NHTSA FCW Test, "**Test 1 – Subject Vehicle Encounters Stopped Principal Other Vehicle,**" are not included as part of this MOU.

⁴ Available at http://www.iihs.org/media/a582abfb-7691-4805-81aa-16bbdf622992/-2036166062/Ratings/Protocols/current/test_protocol_aeb.pdf



States no later than the realization year set forth below. For the purposes of this commitment “substantially all” light-duty vehicles and trucks means 95 percent of vehicles intended for sale in the United States and manufactured⁵ beginning on September 1 of the realization year through August 31 of the following year. In addition, we may elect to exempt from being counted for the purposes of conformance with this commitment (a) vehicles manufactured for use as police or other emergency services vehicles, and/or (b) vehicles with re-design or end-of-life cycles occurring within 12 months of the realization date, so long as the redesigned vehicle is equipped with conforming standard AEB or the original vehicle is not replaced.

3. TIME FRAME FOR REALIZATION OF STANDARD AEB

Audi of America, who independently and voluntarily commits to make AEB technology, as described in this document, a standard feature on substantially all light duty vehicles and trucks in the following realization years:

- A. For light duty vehicles and trucks 8,500 lbs. GVWR or less: no later than 2022 (i.e., manufactured beginning on September 1, 2022, through August 31, 2023); and
- B. For light duty vehicles and trucks between 8,501 and 10,000 lbs. GVWR: no later than 2025 (i.e., manufactured beginning on September 1, 2025, through August 31, 2026).

Additionally, we may, at our option, initially exempt vehicles with manual transmissions from being counted towards the 2022 realization date, and instead voluntarily make AEB standard equipment on substantially all such vehicles no later than 2024 (i.e., manufactured beginning on September 1, 2024, through August 31, 2025).

4. MONITORING PROGRESS TOWARD STANDARD AEB

NHTSA has kept the public informed about this activity through the public docket (No. NHTSA-2015-0101). Beginning in 2017, Audi of America will voluntarily submit to the public docket by October 31 of each year an annual report setting forth the proportion of vehicles manufactured for sale in the United States beginning on September 1 of the previous year through August 31 of the current year that conform to the specifications of this document. Once we have demonstrated conformance with this commitment, we will no longer submit such reports to the public docket, and expect to be deemed as

⁵ Vehicles badged/branded as Audi of America products, regardless of which other company may have manufactured them.



Audi

having fulfilled our obligations under this commitment. To increase consumer awareness, IIHS and NHTSA agree to occasionally publish progress reports, including lists of the year\make\models of vehicles with standard AEB as defined in these principles. Likewise, Audi of America will make efforts to inform its customers about the availability of standard AEB in their product lines.



A Commitment to Advancing Automatic Emergency Braking Technology

INTRODUCTION

New and advanced driver assistance systems that are intended to help drivers avoid crashes are quickly entering the motor vehicle marketplace in the United States. These systems utilize outward-looking sensors to gather information about a wide range of possible hazards associated with crashes and employ various interventions — warning, automated braking, automated steering, etc. — to assist drivers. Many crash avoidance systems are typically offered to consumers as optional content on new vehicles.

One category of crash avoidance system is known as Automatic Emergency Braking (AEB). AEB consists of a Forward Collision Warning (FCW) function designed to detect vehicles or objects ahead and alert a driver of an impending collision, coupled with Crash Imminent Braking (CIB), which provides automatic braking when forward-looking sensors indicate a crash is imminent and the driver is not reacting.

Since 2011, a growing body of research suggests that AEB systems have been beneficial in preventing or mitigating some crashes and resulting injuries and property damage. Various studies have found specific crash reductions associated with various implementations of AEB technology on a variety of vehicle types.¹ In light of such studies, on September 11, 2015, the National Highway Traffic Safety Administration (NHTSA) and the Insurance Institute for Highway Safety (IIHS) called upon automakers to convene a working group to discuss how to best advance these technologies in the near term. This document is the product of such discussions and, although the specific reductions may vary from the results found in the studies footnoted here,

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there is a general expectation that the fleet wide implementation of these principles will reduce overall crashes in the relevant crash scenarios.

The AEB systems for which benefits have been documented do have limitations. Many current AEB systems activate only in front-to-rear crash scenarios. They also may have other technological limitations, such as a narrow range of operating speeds or sensors that are adversely affected by weather conditions, dirt or harsh lighting conditions. Additionally, despite extensive testing by automakers, it is possible that customers could experience unique situations resulting in unwarranted interventions by the systems. These occurrences are expected to be infrequent and have a minimal influence on the greater benefits of these systems.

BMW of North America, LLC ("BMW NA") independently and voluntarily commits to make AEB systems a standard feature on substantially all new vehicles (as set forth in this document) by the applicable realization dates listed below. Nothing in this document prevents BMW NA from: (a) introducing AEB with a higher functionality than that set forth in this document; (b) making AEB standard on all vehicles earlier than the commitment in this document; or (c) using any technology it independently chooses to satisfy the AEB performance standards. Moreover, nothing in this document is intended to prevent BMW NA from developing new or different braking technologies in the future. Finally, nothing in this commitment prevents NHTSA or IIHS from pursuing other initiatives to advance the performance of AEB systems or from BMW NA meeting its statutory or regulatory obligations under federal law.

1. DEFINITION OF AEB FUNCTIONALITY

AEB functionality for the purposes of this commitment, along with the associated test procedures, are set forth in this section. We note that AEB technology is evolving, and this commitment will not stand in the way of the development of systems with greater functionality. As such, the level of functionality and test protocols described herein are intended to identify the minimum level of functionality needed to meet the conditions of this commitment, and will not prevent BMW NA from offering more advanced technologies.

An AEB system satisfying the terms of this commitment shall have two features, FCW and CIB.

A. Forward Collision Warning

AEB systems conforming to this commitment will include an FCW system that, when tested according to the procedures described in NHTSA's **Forward Collision Warning System Confirmation Test, February 2013**² (the "NHTSA FCW Test"), meets the **Alert Criteria** for tests 2 and 3. Specifically, as set forth in

² Available at www.safercar.gov/staticfiles/safercar/NCAP/FCW_NCAP_Test_Procedure_2-7-2013.pdf



Section 12.3 of the NHTSA FCW Test, “**Test 2 – Subject Vehicle Encounters Decelerating Principal Other Vehicle**” specifies that the FCW alert shall be issued when the time-to-collision (TTC) is at least 2.4 seconds under the conditions set forth in that test. As set forth in Section 12.4 of the NHTSA FCW Test, “**Test 3 – Subject Vehicle Encounters Slower Principal Other Vehicle**” specifies that the FCW alert shall be issued when the time-to-collision (TTC) is at least 2.0 seconds under the conditions set forth in that test.³

B. Crash Imminent Braking

AEB systems conforming to this commitment will also include a CIB system that, when tested according to the procedures described in IIHS’s **Autonomous Emergency Braking Test Protocol (Version I), October 2013⁴**, produce speed reductions according to option A or B:

Option A – Average speed reduction across 5 repeated tests that is greater than 10 miles per hour (mph) in either the 12 or 24 mph tests involving a stationary lead vehicle

OR

Option B – Average speed reduction across 5 repeated tests that is greater than 5 mph in both the 12 and 24 mph tests involving a stationary lead vehicle.

2. APPLICABILITY

BMW NA independently and voluntarily commits to make AEB technology conforming to Sections 1.A and 1.B of this document standard equipment in substantially all light-duty vehicles and trucks (i.e., those with a gross vehicle weight rating (GVWR) of 10,000 pounds or less) manufactured for sale in the United States no later than the realization year set forth below. For the purposes of this commitment “substantially all” light-duty vehicles and trucks means 95 percent of vehicles intended for sale in the United States and manufactured⁵ beginning on September 1 of the realization year through August 31 of the following year. In addition, we may elect to exempt from being counted for the purposes of conformance with this commitment: (a) vehicles manufactured for use as police or other emergency services vehicles; and/or (b) vehicles with re-design or end-of-life cycles occurring within 12 months of the realization date, so long as the redesigned vehicle is equipped with conforming standard AEB or the original vehicle is not replaced.

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⁵ A vehicle’s manufacturer shall be defined based on the badging/brand of the vehicle, regardless of which company may have manufactured the vehicle.



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Additionally, BMW NA may, at its option, initially exempt vehicles with manual transmissions from being counted towards the 2022 realization date, and instead voluntarily make AEB standard equipment on substantially all such vehicles no later than 2024 (i.e., manufactured beginning on September 1, 2024, through August 31, 2025).

4. MONITORING PROGRESS TOWARD STANDARD AEB

NHTSA has kept the public informed about this activity through the public docket (No. NHTSA-2015-0101). Beginning in 2017, *BMW NA* will voluntarily submit to the public docket by October 31 of each year an annual report setting forth the proportion of vehicles manufactured for sale in the United States beginning on September 1 of the previous year through August 31 of the current year with an AEB system. Once we have demonstrated conformance with this commitment, we will no longer submit such reports to the public docket, and it will be deemed as having fulfilled its obligations under this commitment. To increase consumer awareness, IIHS and NHTSA agree to occasionally publish progress reports, including lists of the year's models of vehicles with standard AEB as defined in these principles. Likewise, BMW NA will make efforts to inform its customers about the availability of standard AEB in their product lines.

A handwritten signature in black ink, appearing to read 'Christoph Huss', is written over a horizontal line.

Christoph Huss
Vice President Engineering BMW of North America, LLC



FIAT CHRYSLER AUTOMOBILES

(via email)

04 March 2016

Nat Beuse, Associate Administrator, Vehicle Safety Research
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David Zuby, Executive Vice President & Chief Research Officer
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Automatic Emergency Braking (AEB)

FCA US LLC appreciates the collaborative leadership NHTSA and IIHS have demonstrated with the AEB Working Group over the past few months. Your vision and guidance brought automakers together and resulted in a substantive plan that will increasingly benefit the driving public. Per your instructions, please use this note as confirmation that FCA US plans to conform with the plan (attached).

On behalf of FCA US LLC,

Michael Dahl

VP and Head of Vehicle Safety & Regulatory Compliance

A Commitment to Advancing Automatic Emergency Braking Technology

INTRODUCTION

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One category of crash avoidance system is known as Automatic Emergency Braking (AEB). AEB consists of a Forward Collision Warning (FCW) function designed to detect vehicles or objects ahead and alert a driver of an impending collision, coupled with Crash Imminent Braking (CIB), which provides automatic braking when forward-looking sensors indicate a crash is imminent and the driver is not reacting.

Since 2011, a growing body of research suggests that AEB systems have been beneficial in preventing or mitigating some crashes and resulting injuries and property damage. Various studies have found specific crash reductions associated with various implementations of AEB technology on a variety of vehicle types.¹ In light of such studies, on September 11, 2015, the National Highway Traffic Safety Administration (NHTSA) and the Insurance Institute for Highway Safety (IIHS) called upon automakers to convene a working group to discuss how to best advance these technologies in the near term. This document is the product of such discussions and, although the specific reductions may vary from the results found in the studies footnoted here, there is a general expectation that the fleet wide implementation of the basic performance requirements contained in this document will reduce overall crashes in the relevant crash scenarios.

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(Name of automaker) **independently** and **voluntarily** commits to make AEB systems a standard feature on substantially all new vehicles (as set forth in this document) by the realization date(s) listed below. Nothing in this document prevents *(Name of automaker)* from (a) introducing AEB with a higher functionality than that set forth in this document; (b) making AEB standard on all vehicles earlier than the commitment in this document; or (c) using any technology we independently choose to satisfy the AEB performance standards. Moreover, nothing in this document is intended to prevent *(Name of automaker)* from developing new or different braking technologies in the future. Finally, nothing in this commitment prevents or is intended to prevent: (a) NHTSA or IIHS from pursuing other initiatives to advance the performance of AEB systems or (b) *(Name of automaker)* meeting its statutory or regulatory obligations under Federal law.

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2013² (the "NHTSA FCW Test"), meets the **Alert Criteria** for tests 2 and 3. Specifically, as set forth in Section 12.3 of the NHTSA FCW Test, "**Test 2 – Subject Vehicle Encounters Decelerating Principal Other Vehicle**" specifies that the FCW alert shall be issued when the time-to-collision (TTC) is at least 2.4 seconds under the conditions set forth in that test. As set forth in Section 12.4 of the NHTSA FCW Test, "**Test 3 – Subject Vehicle Encounters Slower Principal Other Vehicle**" specifies that the FCW alert shall be issued when the time-to-collision (TTC) is at least 2.0 seconds under the conditions set forth in that test.³

B. Crash Imminent Braking

AEB systems conforming to this commitment will also include a CIB system that, when tested according to the procedures described in IIHS's **Autonomous Emergency Braking Test Protocol (Version I), October 2013⁴**, produce speed reductions according to option A or B:

Option A – Average speed reduction across 5 repeated tests that is greater than 10 miles per hour (mph) in either the 12 or 24 mph tests involving a stationary lead vehicle

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3. TIME FRAME FOR REALIZATION OF STANDARD AEB

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One category of crash avoidance system is known as Automatic Emergency Braking (AEB). AEB consists of a Forward Collision Warning (FCW) function designed to detect vehicles or objects ahead and alert a driver of an impending collision, coupled with Crash Imminent Braking (CIB), which provides automatic braking when forward-looking sensors indicate a crash is imminent and the driver is not reacting.

Since 2011, a growing body of research suggests that AEB systems have been beneficial in preventing or mitigating some crashes and resulting injuries and property damage. Various studies have found specific crash reductions associated with various implementations of AEB technology on a variety of vehicle types.¹ In light of such studies, on September 11, 2015, the National Highway Traffic Safety Administration (NHTSA) and the Insurance Institute for Highway Safety (IIHS) called upon automakers to convene a working group to discuss how to best advance these technologies in the near term. This document is the product of such discussions and, although the specific reductions may vary from the results found in the studies footnoted here, there is a general expectation that the fleet wide

¹ See Highway Loss Data Institute Bulletin Vol. 28 No. 6 **Volvo City Safety loss experience — initial results** available at www.iihs.org; Highway Loss Data Institute Bulletin Vol. 32 No. 1 **Volvo City Safety loss experience — a long term update** available at www.iihs.org; Highway Loss Data Institute Bulletin Vol. 32 No. 13 **Volvo City Safety loss experience by vehicle ages** available at www.iihs.org; **Effectiveness of low speed autonomous emergency braking in real-world rear-end crashes**; Fildes, B. et al. *Accident Analysis and Prevention*, August 2015; **Real world performance of City Safety based on Swedish insurance data**; Isaksson-Hellman, I. and Lindman, M. & **AEB real world validation using UK motor insurance claims data**; Doyle, M. et al. in *Proceedings of 2015 Enhanced Safety of Vehicles Conference*; Highway Loss Data Institute Bulletins Vol. 28 No. 21 (Acura), Vol. 29 No. 5 (Volvo) & No. 7 (Mercedes-Benz), Vol. 31 no. 2 (Honda), Vol. 32 Nos. 7, 8, 22, 33 (Honda, Subaru, Mazda, Honda respectively) available at www.iihs.org; **Effectiveness of forward collision warning systems with and without autonomous emergency braking in reducing police-reported crash rates**; Cicchino, J.B., January 2016 available at www.iihs.org; **Effectiveness of Volvo's City Safety low-speed autonomous emergency braking system in reducing police-reported crash rates**; Cicchino, J.B., January 2016 available at www.iihs.org.



implementation of the basic performance requirements contained in this document will reduce overall crashes in the relevant crash scenarios.

The AEB systems for which benefits have been documented do have limitations. Many current AEB systems activate only in front-to-rear crash scenarios. They also may have other technological limitations, such as a narrow range of operating speeds or sensors that are adversely affected by weather conditions, dirt or harsh lighting conditions. Additionally, despite extensive testing by automakers, it is possible that customers could experience unique situations resulting in unwarranted interventions by the systems. These occurrences are expected to be infrequent and have a minimal influence on the greater benefits of these systems.

Ford Motor Company (Ford) **independently** and **voluntarily** commits to make AEB systems a standard feature on substantially all new vehicles (as set forth in this document) by the realization date(s) listed below. Nothing in this document prevents *Ford* from (a) introducing AEB with a higher functionality than that set forth in this document; (b) making AEB standard on all vehicles earlier than the commitment in this document; or (c) using any technology we independently choose to satisfy the AEB performance standards. Moreover, nothing in this document is intended to prevent *Ford* from developing new or different braking technologies in the future. Finally, nothing in this commitment prevents or is intended to prevent: (a) NHTSA or IIHS from pursuing other initiatives to advance the performance of AEB systems or (b) Ford meeting its statutory or regulatory obligations under Federal law.

1. DEFINITION OF AEB FUNCTIONALITY

AEB functionality for the purposes of this commitment, along with the associated test procedures, are set forth in this section. We note that AEB technology is evolving, and this commitment will not stand in the way of the development of systems with greater functionality. As such, the level of functionality and test protocols described herein are intended to identify the minimum level of functionality needed to meet the conditions of this commitment, and nothing will prevent *Ford* from offering more advanced technologies.



An AEB system satisfying the terms of this commitment shall have two features, FCW and CIB.

A. Forward Collision Warning

AEB systems conforming to this commitment will include an FCW system that, when tested according to the procedures described in NHTSA's **Forward Collision Warning System Confirmation Test, February 2013**² (the "NHTSA FCW Test"), meets the **Alert Criteria** for tests 2 and 3. Specifically, as set forth in Section 12.3 of the NHTSA FCW Test, "**Test 2 – Subject Vehicle Encounters Decelerating Principal Other Vehicle**" specifies that the FCW alert shall be issued when the time-to-collision (TTC) is at least 2.4 seconds under the conditions set forth in that test. As set forth in Section 12.4 of the NHTSA FCW Test, "**Test 3 – Subject Vehicle Encounters Slower Principal Other Vehicle**" specifies that the FCW alert shall be issued when the time-to-collision (TTC) is at least 2.0 seconds under the conditions set forth in that test.³

B. Crash Imminent Braking

AEB systems conforming to this commitment will also include a CIB system that, when tested according to the procedures described in IIHS's **Autonomous Emergency Braking Test Protocol (Version I), October 2013**⁴, produce speed reductions according to option A or B:

Option A – Average speed reduction across 5 repeated tests that is greater than 10 miles per hour (mph) in either the 12 or 24 mph tests involving a stationary lead vehicle

OR

Option B – Average speed reduction across 5 repeated tests that is greater than 5 mph in both the 12 and 24 mph tests involving a stationary lead vehicle.

² Available at www.safercar.gov/staticfiles/safercar/NCAP/FCW_NCAP_Test_Procedure_2-7-2013.pdf

³ The requirements described in section 12.2 of the NHTSA FCW Test, "**Test 1 – Subject Vehicle Encounters Stopped Principal Other Vehicle,**" are not included as part of this MOU.

⁴ Available at http://www.iihs.org/media/a582abfb-7691-4805-81aa-16bbdf622992/-2036166062/Ratings/Protocols/current/test_protocol_aeb.pdf



2. APPLICABILITY

Ford independently and voluntarily commits to make AEB technology conforming to Sections 1.A and 1.B of this document standard equipment in substantially all light-duty vehicles and trucks (i.e., those with a gross vehicle weight rating (GVWR) of 10,000 pounds or less) sold in the United States no later than the realization year set forth below. For the purposes of this commitment “substantially all” light-duty vehicles and trucks means 95 percent of vehicles intended for sale in the United States and manufactured⁵ beginning on September 1 of the realization year through August 31 of the following year. In addition, we may elect to exempt from being counted for the purposes of conformance with this commitment (a) vehicles manufactured for use as police or other emergency services vehicles, and/or (b) vehicles with re-design or end-of-life cycles occurring within 12 months of the realization date, so long as the redesigned vehicle is equipped with conforming standard AEB or the original vehicle is not replaced.

3. TIME FRAME FOR REALIZATION OF STANDARD AEB

(Name of automaker), who independently and voluntarily commits to make AEB technology, as described in this document, a standard feature on substantially all light duty vehicles and trucks in the following realization years:

- A. For light duty vehicles and trucks 8,500 lbs. GVWR or less: no later than 2022 (i.e., manufactured beginning on September 1, 2022, through August 31, 2023); and
- B. For light duty vehicles and trucks between 8,501 and 10,000 lbs. GVWR: no later than 2025 (i.e., manufactured beginning on September 1, 2025, through August 31, 2026).

Additionally, we may, at our option, initially exempt vehicles with manual transmissions from being counted towards the 2022 realization date, and instead voluntarily make AEB standard equipment on substantially all such vehicles no later than 2024 (i.e., manufactured beginning on September 1, 2024, through August 31, 2025).

⁵ Vehicles badged/branded as Ford products, regardless of which other company may have manufactured them.



4. MONITORING PROGRESS TOWARD STANDARD AEB

NHTSA has kept the public informed about this activity through the public docket (No. NHTSA-2015-0101). Beginning in 2017, *Ford* will voluntarily submit to the public docket by October 31 of each year an annual report setting forth the proportion of vehicles manufactured for sale in the United States beginning on September 1 of the previous year through August 31 of the current year that conform to the specifications of this document. Once we have demonstrated conformance with this commitment, we will no longer submit such reports to the public docket, and expect to be deemed as having fulfilled our obligations under this commitment. To increase consumer awareness, IIHS and NHTSA agree to occasionally publish progress reports, including lists of the year\make\models of vehicles with standard AEB as defined in these principles. Likewise, *Ford* will make efforts to inform its customers about the availability of standard AEB in their product lines.



General Motors LLC
MC: 480-210-2V
30001 Van Dyke Avenue
Warren, MI 48093-2350

Commitment to Advancing Automatic Emergency Braking Technology

INTRODUCTION

New and advanced driver assistance systems that are intended to help drivers avoid crashes are quickly entering the motor vehicle marketplace in the United States. These systems utilize outward-looking sensors to gather information about a wide range of possible hazards associated with crashes and employ various interventions — warning, automated braking, automated steering, etc. — to assist drivers. Many crash avoidance systems are typically offered to consumers as optional content on new vehicles.

One category of crash avoidance system is known as Automatic Emergency Braking (AEB). AEB consists of a Forward Collision Warning (FCW) function designed to detect vehicles or objects ahead and alert a driver of an impending collision, coupled with Crash Imminent Braking (CIB), which provides automatic braking when forward-looking sensors indicate a crash is imminent and the driver is not reacting.

Since 2011, a growing body of research suggests that AEB systems have been beneficial in preventing or mitigating some crashes and resulting injuries and property damage. Various studies have found specific crash reductions associated with various implementations of AEB technology on a variety of vehicle types.¹ In light of such studies, on September 11, 2015, the

¹ See Highway Loss Data Institute Bulletin Vol. 28 No. 6 **Volvo City Safety loss experience — initial results** available at www.iihs.org; Highway Loss Data Institute Bulletin Vol. 32 No. 1 **Volvo City Safety loss experience — a long term update** available at www.iihs.org; Highway Loss Data Institute Bulletin Vol. 32 No. 13 **Volvo City Safety loss experience by vehicle ages** available at www.iihs.org; **Effectiveness of low speed autonomous emergency braking in real-world rear-end crashes**; Fildes, B. et al. *Accident Analysis and Prevention*, August 2015; **Real world performance of City Safety based on Swedish insurance data**; Isaksson-Hellman, I. and Lindman, M. & **AEB real world validation using UK motor insurance claims data**; Doyle, M. et al. in *Proceedings of 2015 Enhanced Safety of Vehicles Conference*; Highway Loss Data Institute Bulletins Vol. 28 No. 21 (Acura), Vol. 29 No. 5 (Volvo) & No. 7 (Mercedes-Benz), Vol. 31 no. 2 (Honda), Vol. 32 Nos. 7, 8, 22, 33 (Honda, Subaru, Mazda, Honda respectively) available at www.iihs.org; **Effectiveness of forward collision warning systems with and without autonomous emergency braking in reducing police-reported crash rates**; Cicchino, J.B., January 2016 available at www.iihs.org; **Effectiveness of Volvo's City Safety low-speed autonomous emergency braking system in reducing police-reported crash rates**; Cicchino, J.B., January 2016 available at www.iihs.org.



GENERAL MOTORS

National Highway Traffic Safety Administration (NHTSA) and the Insurance Institute for Highway Safety (IIHS) called upon automakers to convene a working group to discuss how to best advance these technologies in the near term. This document is the product of such discussions and, although the specific reductions may vary from the results found in the studies footnoted here, there is a general expectation that the fleet wide implementation of the basic performance requirements contained in this document will reduce overall crashes in the relevant crash scenarios.

The AEB systems for which benefits have been documented do have limitations. Many current AEB systems activate only in front-to-rear crash scenarios. They also may have other technological limitations, such as a narrow range of operating speeds or sensors that are adversely affected by weather conditions, dirt or harsh lighting conditions. Additionally, despite extensive testing by automakers, it is possible that customers could experience unique situations resulting in unwarranted interventions by the systems. These occurrences are expected to be infrequent and have a minimal influence on the greater benefits of these systems.

General Motors LLC (“GM”) **independently** and **voluntarily** commits to make AEB systems a standard feature on substantially all new vehicles (as set forth in this document) by the realization date(s) listed below. Nothing in this document prevents GM from (a) introducing AEB with a higher functionality than that set forth in this document; (b) making AEB standard on all vehicles earlier than the commitment in this document; or (c) using any technology we independently choose to satisfy the AEB performance standards. Moreover, nothing in this document is intended to prevent GM from developing new or different braking technologies in the future. Finally, nothing in this commitment prevents or is intended to prevent: (a) NHTSA or IIHS from pursuing other initiatives to advance the performance of AEB systems or (b) GM meeting its statutory or regulatory obligations under Federal law.

DEFINITION OF AEB FUNCTIONALITY

AEB functionality for the purposes of this commitment, along with the associated test procedures, are set forth in this section. We note that AEB technology is evolving, and this commitment will not stand in the way of the development of systems with greater functionality. As such, the level of functionality and test protocols described herein are intended to identify the



minimum level of functionality needed to meet the conditions of this commitment, and nothing will prevent GM from offering more advanced technologies.

An AEB system satisfying the terms of this commitment shall have two features, FCW and CIB.

A. Forward Collision Warning

AEB systems conforming to this commitment will include an FCW system that, when tested according to the procedures described in NHTSA's **Forward Collision Warning System Confirmation Test, February 2013**² (the "NHTSA FCW Test"), meets the **Alert Criteria** for tests 2 and 3. Specifically, as set forth in Section 12.3 of the NHTSA FCW Test, "**Test 2 – Subject Vehicle Encounters Decelerating Principal Other Vehicle**" specifies that the FCW alert shall be issued when the time-to-collision (TTC) is at least 2.4 seconds under the conditions set forth in that test. As set forth in Section 12.4 of the NHTSA FCW Test, "**Test 3 – Subject Vehicle Encounters Slower Principal Other Vehicle**" specifies that the FCW alert shall be issued when the time-to-collision (TTC) is at least 2.0 seconds under the conditions set forth in that test.³

B. Crash Imminent Braking

AEB systems conforming to this commitment will also include a CIB system that, when tested according to the procedures described in IIHS's **Autonomous Emergency Braking Test Protocol (Version I), October 2013**⁴, produce speed reductions according to option A or B:

- Option A – Average speed reduction across 5 repeated tests that is greater than 10 miles per hour (mph) in either the 12 or 24 mph tests involving a stationary lead vehicle

OR

- Option B – Average speed reduction across 5 repeated tests that is greater than 5 mph in both the 12 and 24 mph tests involving a stationary lead vehicle.

² Available at www.safercar.gov/staticfiles/safercar/NCAP/FCW_NCAP_Test_Procedure_2-7-2013.pdf

³ The requirements described in section 12.2 of the NHTSA FCW Test, "**Test 1 – Subject Vehicle Encounters Stopped Principal Other Vehicle**," are not included as part of this MOU.

⁴ Available at http://www.iihs.org/media/a582abfb-7691-4805-81aa-16bbdf622992/-2036166062/Ratings/Protocols/current/test_protocol_aeb.pdf



APPLICABILITY

GM independently and voluntarily commits to make AEB technology conforming to Sections 1.A and 1.B of this document standard equipment in substantially all light-duty vehicles and trucks (i.e., those with a gross vehicle weight rating (GVWR) of 10,000 pounds or less) sold in the United States no later than the realization year set forth below. For the purposes of this commitment “substantially all” light-duty vehicles and trucks means 95 percent of vehicles intended for sale in the United States and manufactured⁵ beginning on September 1 of the realization year through August 31 of the following year. In addition, we may elect to exempt from being counted for the purposes of conformance with this commitment (a) vehicles manufactured for use as police or other emergency services vehicles, and/or (b) vehicles with re-design or end-of-life cycles occurring within 12 months of the realization date, so long as the redesigned vehicle is equipped with conforming standard AEB or the original vehicle is not replaced.

TIME FRAME FOR REALIZATION OF STANDARD AEB

GM, who independently and voluntarily commits to make AEB technology, as described in this document, a standard feature on substantially all light duty vehicles and trucks in the following realization years:

- A. For light duty vehicles and trucks 8,500 lbs. GVWR or less: no later than 2022 (i.e., manufactured beginning on September 1, 2022, through August 31, 2023); and
- B. For light duty vehicles and trucks between 8,501 and 10,000 lbs. GVWR: no later than 2025 (i.e., manufactured beginning on September 1, 2025, through August 31, 2026).

Additionally, we may, at our option, initially exempt vehicles with manual transmissions from being counted towards the 2022 realization date, and instead voluntarily make AEB standard equipment on substantially all such vehicles no later than 2024 (i.e., manufactured beginning on September 1, 2024, through August 31, 2025).

⁵ Vehicles badged/branded as GM products, regardless of which other company may have manufactured them.



MONITORING PROGRESS TOWARD STANDARD AEB

NHTSA has kept the public informed about this activity through the public docket (No. NHTSA-2015-0101). Beginning in 2017, GM will voluntarily submit to the public docket by October 31 of each year an annual report setting forth the proportion of vehicles manufactured for sale in the United States beginning on September 1 of the previous year through August 31 of the current year that conform to the specifications of this document. Once we have demonstrated conformance with this commitment, we will no longer submit such reports to the public docket, and expect to be deemed as having fulfilled our obligations under this commitment. To increase consumer awareness, IIHS and NHTSA agree to occasionally publish progress reports, including lists of the year\make\models of vehicles with standard AEB as defined in these principles. Likewise, GM will make efforts to inform its customers about the availability of standard AEB in their product lines.



GENERAL MOTORS

HONDA

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John Turley
Senior Manager, Product Safety

4 March 2016

A Commitment to Advancing Automatic Emergency Braking Technology

INTRODUCTION

New and advanced driver assistance systems that are intended to help drivers avoid crashes are quickly entering the motor vehicle marketplace in the United States. These systems utilize outward-looking sensors to gather information about a wide range of possible hazards associated with crashes and employ various interventions — warning, automated braking, automated steering, etc. — to assist drivers. Many crash avoidance systems are typically offered to consumers as optional content on new vehicles.

One category of crash avoidance system is known as Automatic Emergency Braking (AEB). AEB consists of a Forward Collision Warning (FCW) function designed to detect vehicles or objects ahead and alert a driver of an impending collision, coupled with Crash Imminent Braking (CIB), which provides automatic braking when forward-looking sensors indicate a crash is imminent and the driver is not reacting.

Since 2011, a growing body of research suggests that AEB systems have been beneficial in preventing or mitigating some crashes and resulting injuries and property damage. Various studies have found specific crash reductions associated with various implementations of AEB technology on a variety of vehicle types.¹ In light of such studies, on September 11, 2015, the

www.iihs.org;

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National Highway Traffic Safety Administration (NHTSA) and the Insurance Institute for Highway Safety (IIHS) called upon automakers to convene a working group to discuss how to best advance these technologies in the near term. This document is the product of such discussions and, although the specific reductions may vary from the results found in the studies footnoted here, there is a general expectation that the fleet wide implementation of the basic performance requirements contained in this document will reduce overall crashes in the relevant crash scenarios.

The AEB systems for which benefits have been documented do have limitations. Many current AEB systems activate only in front-to-rear crash scenarios. They also may have other technological limitations, such as a narrow range of operating speeds or sensors that are adversely affected by weather conditions, dirt or harsh lighting conditions. Additionally, despite extensive testing by automakers, it is possible that customers could experience unique situations resulting in unwarranted interventions by the systems. These occurrences are expected to be infrequent and have a minimal influence on the greater benefits of these systems.

American Honda Motor Co., Inc. ("Honda") independently and voluntarily commits to make AEB systems a standard feature on substantially all new vehicles (as set forth in this document) it distributes in the United States by the realization date(s) listed below. Nothing in this document prevents Honda from (a) introducing AEB with a higher functionality than that set forth in this document; (b) making AEB standard on all vehicles earlier than the commitment in this document; or (c) using any technology it independently chooses to satisfy the AEB performance standards. Moreover, nothing in this document is intended to prevent Honda from developing new or different braking technologies in the future. Finally, nothing in this commitment prevents or is intended to prevent: (a) NHTSA or IIHS from pursuing other initiatives to advance the performance of AEB systems or (b) Honda from meeting its statutory or regulatory obligations under Federal law.

1. DEFINITION OF AEB FUNCTIONALITY

AEB functionality for the purposes of this commitment, along with the associated test procedures, is set forth in this section. Honda notes that AEB technology is evolving, and this commitment will not stand in the way of the development of systems with greater functionality. As such, the level of functionality and test protocols described herein are intended to identify the minimum level of functionality needed to meet the conditions of this commitment, and nothing will prevent Honda from offering more advanced technologies.

An AEB system satisfying the terms of this commitment shall have two features, FCW and CIB

A. Forward Collision Warning

AEB systems conforming to this commitment will include an FCW system that, when tested according to the procedures described in NHTSA's **Forward Collision Warning System Confirmation Test, February 2013**² (the "NHTSA FCW Test"), meets the **Alert Criteria** for tests 2 and 3. Specifically, as set forth in Section 12.3 of the NHTSA FCW Test, "**Test 2 – Subject Vehicle Encounters Decelerating Principal Other Vehicle**" specifies that the FCW alert shall be issued when the time-to-collision (TTC) is at least 2.4 seconds under the conditions set forth in that test. As set forth in Section 12.4 of the NHTSA FCW Test, "**Test 3 – Subject Vehicle Encounters Slower Principal Other Vehicle**" specifies that the FCW alert shall be issued when the time-to-collision (TTC) is at least 2.0 seconds under the conditions set forth in that test.³

B. Crash Imminent Braking

AEB systems conforming to this commitment will also include a CIB system that, when tested according to the procedures described in IIHS' **Autonomous Emergency Braking Test Protocol (Version I), October 2013**⁴, produces speed reductions according to option A or B: Option A – Average speed reduction across 5 repeated tests that is greater than 10 miles per hour (mph) in either the 12 or 24 mph tests involving a stationary lead vehicle;

² Available at www.safercar.gov/staticfiles/safercar/NCAP/FCW_NCAP_Test_Procedure_2-7-2013.pdf

³ The requirements described in section 12.2 of the NHTSA FCW Test, "**Test 1 – Subject Vehicle Encounters Stopped Principal Other Vehicle**," are not included as part of this MOU.

⁴ Available at current/test_protocol_aeb.pdf

OR

Option B – Average speed reduction across 5 repeated tests that is greater than 5 mph in both the 12 and 24 mph tests involving a stationary lead vehicle.

2. APPLICABILITY

Honda independently and voluntarily commits to make AEB technology conforming to Sections 1.A and 1.B of this document standard equipment in substantially all light-duty vehicles and trucks (i.e., those with a gross vehicle weight rating (GVWR) of 10,000 pounds or less) that it distributes in the United States no later than the realization year set forth below. For the purposes of this commitment, “substantially all” light-duty vehicles and trucks means 95 percent of vehicles intended for sale in the United States and manufactured⁵ beginning on September 1 of the realization year through August 31 of the following year. In addition, Honda may elect to exempt from being counted for the purposes of conformance with this commitment (a) vehicles manufactured for use as police or other emergency services vehicles, and/or (b) vehicles with re-design or end-of-life cycles occurring within 12 months of the realization date, so long as the redesigned vehicle is equipped with conforming standard AEB or the original vehicle is not replaced.

3. TIME FRAME FOR REALIZATION OF STANDARD AEB

A. Honda independently and voluntarily commits to make AEB technology, as described in this document, a standard feature on substantially all light duty vehicles and trucks it distributes in the United States, all of which have a GVWR or 8,500 lbs. or less, no later than 2022 (i.e., manufactured beginning on September 1, 2022, through August 31, 2023).

B. Should Honda begin to distribute light duty vehicles and trucks between 8,501 and 10,000 lbs. GVWR in the United States, it independently and voluntarily commits to make AEB technology, as described in this document, a standard feature on substantially all such vehicles no later than 2025 (i.e., manufactured beginning on September 1, 2025, through August 31, 2026).

⁵ Vehicles badged/branded as Honda products, regardless of which other company may have manufactured them.

Additionally, Honda may, at its option, initially exempt vehicles with manual transmissions from being counted towards the 2022 realization date, and instead voluntarily make AEB standard equipment on substantially all such vehicles no later than 2024 (i.e., manufactured beginning on September 1, 2024, through August 31, 2025).

4. MONITORING PROGRESS TOWARDS STANDARD AEB

NHTSA has kept the public informed about this activity through the public docket (No. NHTSA-2015-0101). Beginning in 2017, Honda will voluntarily submit to the public docket by October 31 of each year an annual report setting forth the proportion of vehicles manufactured for sale in the United States beginning on September 1 of the previous year through August 31 of the current year that conform to the specifications of this document. Once Honda has demonstrated conformance with this commitment, it will no longer submit such reports to the public docket, and will expect to be deemed as having fulfilled its obligations under this commitment. To increase consumer awareness, IIHS and NHTSA agree to occasionally publish progress reports, including lists of the year\make\models of vehicles with standard AEB as defined in these principles. Likewise, Honda will make efforts to inform its customers about the availability of standard AEB in its product lines.

C Turley
Senior Manager, Safety
Product Regulatory Office

cc: David Zuby, IIHS

A Commitment to Advancing Automatic Emergency Braking Technology

INTRODUCTION

New and advanced driver assistance systems that are intended to help drivers avoid crashes are quickly entering the motor vehicle marketplace in the United States. These systems utilize outward-looking sensors to gather information about a wide range of possible hazards associated with crashes and employ various interventions — warning, automated braking, automated steering, etc. — to assist drivers. Many crash avoidance systems are typically offered to consumers as optional content on new vehicles.

One category of crash avoidance system is known as Automatic Emergency Braking (AEB). AEB consists of a Forward Collision Warning (FCW) function designed to detect vehicles or objects ahead and alert a driver of an impending collision, coupled with Crash Imminent Braking (CIB), which provides automatic braking when forward-looking sensors indicate a crash is imminent and the driver is not reacting.

Since 2011, a growing body of research suggests that AEB systems have been beneficial in preventing or mitigating some crashes and resulting injuries and property damage. Various studies have found specific crash reductions associated with various implementations of AEB technology on a variety of vehicle types.¹ In light of such studies, on September 11, 2015, the National Highway Traffic Safety Administration (NHTSA) and the Insurance Institute for Highway Safety (IIHS) called upon automakers to convene a working group to discuss how to best advance these technologies in the near term. This document is the product of such discussions and, although the specific reductions may vary from the results found in the studies footnoted here, there is a general expectation that the fleet wide implementation of the basic performance requirements contained in this document will reduce overall crashes in the relevant crash scenarios.

¹ See Highway Loss Data Institute Bulletin Vol. 28 No. 6 **Volvo City Safety loss experience — initial results** available at www.iihs.org; Highway Loss Data Institute Bulletin Vol. 32 No. 1 **Volvo City Safety loss experience – a long term update** available at www.iihs.org; Highway Loss Data Institute Bulletin Vol. 32 No. 13 **Volvo City Safety loss experience by vehicle ages** available at www.iihs.org; **Effectiveness of low speed autonomous emergency braking in real-world rear-end crashes**; Fildes, B. et al. *Accident Analysis and Prevention*, August 2015; **Real world performance of City Safety based on Swedish insurance data**; Isaksson-Hellman, I. and Lindman, M. & **AEB real world validation using UK motor insurance claims data**; Doyle, M. et al. in *Proceedings of 2015 Enhanced Safety of Vehicles Conference*; Highway Loss Data Institute Bulletins Vol. 28 No. 21 (Acura), Vol. 29 No. 5 (Volvo) & No. 7 (Mercedes-Benz), Vol. 31 no. 2 (Honda), Vol. 32 Nos. 7, 8, 22, 33 (Honda, Subaru, Mazda, Honda respectively) available at www.iihs.org; **Effectiveness of forward collision warning systems with and without autonomous emergency braking in reducing police-reported crash rates**; Cicchino, J.B., January 2016 available at www.iihs.org; **Effectiveness of Volvo's City Safety low-speed autonomous emergency braking system in reducing police-reported crash rates**; Cicchino, J.B., January 2016 available at www.iihs.org.

The AEB systems for which benefits have been documented do have limitations. Many current AEB systems activate only in front-to-rear crash scenarios. They also may have other technological limitations, such as a narrow range of operating speeds or sensors that are adversely affected by weather conditions, dirt or harsh lighting conditions. Additionally, despite extensive testing by automakers, it is possible that customers could experience unique situations resulting in unwarranted interventions by the systems. These occurrences are expected to be infrequent and have a minimal influence on the greater benefits of these systems.

Hyundai Motor America **independently** and **voluntarily** commits to make AEB systems a standard feature on substantially all new vehicles (as set forth in this document) by the realization date(s) listed below. Nothing in this document prevents Hyundai Motor America from (a) introducing AEB with a higher functionality than that set forth in this document; (b) making AEB standard on all vehicles earlier than the commitment in this document; or (c) using any technology we independently choose to satisfy the AEB performance standards. Moreover, nothing in this document is intended to prevent Hyundai Motor America from developing new or different braking technologies in the future. Finally, nothing in this commitment prevents or is intended to prevent: (a) NHTSA or IIHS from pursuing other initiatives to advance the performance of AEB systems or (b) Hyundai Motor America meeting its statutory or regulatory obligations under Federal law.

1. DEFINITION OF AEB FUNCTIONALITY

AEB functionality for the purposes of this commitment, along with the associated test procedures, are set forth in this section. We note that AEB technology is evolving, and this commitment will not stand in the way of the development of systems with greater functionality. As such, the level of functionality and test protocols described herein are intended to identify the minimum level of functionality needed to meet the conditions of this commitment, and nothing will prevent Hyundai Motor America from offering more advanced technologies.

An AEB system satisfying the terms of this commitment shall have two features, FCW and CIB.

A. Forward Collision Warning

AEB systems conforming to this commitment will include an FCW system that, when tested according to the procedures described in NHTSA's **Forward Collision Warning System Confirmation Test, February**

2013² (the “NHTSA FCW Test”), meets the **Alert Criteria** for tests 2 and 3. Specifically, as set forth in Section 12.3 of the NHTSA FCW Test, “**Test 2 – Subject Vehicle Encounters Decelerating Principal Other Vehicle**” specifies that the FCW alert shall be issued when the time-to-collision (TTC) is at least 2.4 seconds under the conditions set forth in that test. As set forth in Section 12.4 of the NHTSA FCW Test, “**Test 3 – Subject Vehicle Encounters Slower Principal Other Vehicle**” specifies that the FCW alert shall be issued when the time-to-collision (TTC) is at least 2.0 seconds under the conditions set forth in that test.³

B. Crash Imminent Braking

AEB systems conforming to this commitment will also include a CIB system that, when tested according to the procedures described in IIHS’s **Autonomous Emergency Braking Test Protocol (Version I), October 2013**⁴, produce speed reductions according to option A or B:

Option A – Average speed reduction across 5 repeated tests that is greater than 10 miles per hour (mph) in either the 12 or 24 mph tests involving a stationary lead vehicle

OR

Option B – Average speed reduction across 5 repeated tests that is greater than 5 mph in both the 12 and 24 mph tests involving a stationary lead vehicle.

2. APPLICABILITY

Hyundai Motor America independently and voluntarily commits to make AEB technology conforming to Sections 1.A and 1.B of this document standard equipment in substantially all light-duty vehicles and trucks (i.e., those with a gross vehicle weight rating (GVWR) of 10,000 pounds or less) sold in the United States no later than the realization year set forth below. For the purposes of this commitment “substantially all” light-duty vehicles and trucks means 95 percent of vehicles intended for sale in the United States and manufactured⁵ beginning on September 1 of the realization year through August 31 of

² Available at www.safercar.gov/staticfiles/safercar/NCAP/FCW_NCAP_Test_Procedure_2-7-2013.pdf

³ The requirements described in section 12.2 of the NHTSA FCW Test, “**Test 1 – Subject Vehicle Encounters Stopped Principal Other Vehicle,**” are not included as part of this MOU.

⁴ Available at http://www.iihs.org/media/a582abfb-7691-4805-81aa-16bbdf622992/-2036166062/Ratings/Protocols/current/test_protocol_aeb.pdf

⁵ Vehicles badged/branded as (*Hyundai Motor America*) products, regardless of which other company may have manufactured them.

the following year. In addition, we may elect to exempt from being counted for the purposes of conformance with this commitment (a) vehicles manufactured for use as police or other emergency services vehicles, and/or (b) vehicles with re-design or end-of-life cycles occurring within 12 months of the realization date, so long as the redesigned vehicle is equipped with conforming standard AEB or the original vehicle is not replaced.

3. TIME FRAME FOR REALIZATION OF STANDARD AEB

Hyundai Motor America, who independently and voluntarily commits to make AEB technology, as described in this document, a standard feature on substantially all light duty vehicles and trucks in the following realization years:

- A. For light duty vehicles and trucks 8,500 lbs. GVWR or less: no later than 2022 (i.e., manufactured beginning on September 1, 2022, through August 31, 2023); and
- B. For light duty vehicles and trucks between 8,501 and 10,000 lbs. GVWR: no later than 2025 (i.e., manufactured beginning on September 1, 2025, through August 31, 2026).

Additionally, we may, at our option, initially exempt vehicles with manual transmissions from being counted towards the 2022 realization date, and instead voluntarily make AEB standard equipment on substantially all such vehicles no later than 2024 (i.e., manufactured beginning on September 1, 2024, through August 31, 2025).

4. MONITORING PROGRESS TOWARD STANDARD AEB

NHTSA has kept the public informed about this activity through the public docket (No. NHTSA-2015-0101). Beginning in 2017, Hyundai Motor America will voluntarily submit to the public docket by October 31 of each year an annual report setting forth the proportion of vehicles manufactured for sale in the United States beginning on September 1 of the previous year through August 31 of the current year that conform to the specifications of this document. Once we have demonstrated conformance with this commitment, we will no longer submit such reports to the public docket, and expect to be deemed as having fulfilled our obligations under this commitment. To increase consumer awareness, IIHS and NHTSA agree to occasionally publish progress reports, including lists of the year\make\models of vehicles with standard AEB as defined in these principles. Likewise, Hyundai Motor America will make efforts to inform its customers about the availability of standard AEB in their product lines.



February 25, 2016

A Commitment to Advancing Automatic Emergency Braking Technology

INTRODUCTION

New and advanced driver assistance systems that are intended to help drivers avoid crashes are quickly entering the motor vehicle marketplace in the United States. These systems utilize outward-looking sensors to gather information about a wide range of possible hazards associated with crashes and employ various interventions — warning, automated braking, automated steering, etc. — to assist drivers. Many crash avoidance systems are typically offered to consumers as optional content on new vehicles.

One category of crash avoidance system is known as Automatic Emergency Braking (AEB). AEB consists of a Forward Collision Warning (FCW) function designed to detect vehicles or objects ahead and alert a driver of an impending collision, coupled with Crash Imminent Braking (CIB), which provides automatic braking when forward-looking sensors indicate a crash is imminent and the driver is not reacting.

Since 2011, a growing body of research suggests that AEB systems have been beneficial in preventing or mitigating some crashes and resulting injuries and property damage. Various studies have found specific crash reductions associated with various implementations of AEB technology on a variety of vehicle types.¹ In light of such studies, on September 11, 2015, the National Highway Traffic Safety

¹ See Highway Loss Data Institute Bulletin Vol. 28 No. 6 **Volvo City Safety loss experience — initial results** available at www.iihs.org; Highway Loss Data Institute Bulletin Vol. 32 No. 1 **Volvo City Safety loss experience — a long term update** available at www.iihs.org; Highway Loss Data Institute Bulletin Vol. 32 No. 13 **Volvo City Safety loss experience by vehicle ages** available at www.iihs.org; **Effectiveness of low speed autonomous emergency braking in real-world rear-end crashes**; Fildes, B. et al. *Accident Analysis and Prevention*, August 2015; **Real world performance of City Safety based on Swedish insurance data**; Isaksson-Hellman, I. and Lindman, M. & **AEB real world validation using UK motor insurance claims data**; Doyle, M. et al. in *Proceedings of 2015 Enhanced Safety of Vehicles Conference*; Highway Loss Data Institute Bulletins Vol. 28 No. 21 (Acura), Vol. 29 No. 5 (Volvo) & No. 7 (Mercedes-Benz), Vol. 31 no. 2 (Honda), Vol. 32 Nos. 7, 8, 22, 33 (Honda, Subaru, Mazda, Honda respectively) available at www.iihs.org; **Effectiveness of forward collision warning systems with and without autonomous emergency braking in reducing police-reported crash rates**; Cicchino, J.B., January 2016 available at www.iihs.org;

Administration (NHTSA) and the Insurance Institute for Highway Safety (IIHS) called upon automakers to convene a working group to discuss how to best advance these technologies in the near term. This document is the product of such discussions and, although the specific reductions may vary from the results found in the studies footnoted here, there is a general expectation that the fleet wide implementation of the basic performance requirements contained in this document will reduce overall crashes in the relevant crash scenarios.

The AEB systems for which benefits have been documented do have limitations. Many current AEB systems activate only in front-to-rear crash scenarios. They also may have other technological limitations, such as a narrow range of operating speeds or sensors that are adversely affected by weather conditions, dirt or harsh lighting conditions. Additionally, despite extensive testing by automakers, it is possible that customers could experience unique situations resulting in unwarranted interventions by the systems. These occurrences are expected to be infrequent and have a minimal influence on the greater benefits of these systems.

Jaguar Land Rover **independently** and **voluntarily** commits to make AEB systems a standard feature on substantially all new vehicles (as set forth in this document) by the realization date(s) listed below. Nothing in this document prevents *Jaguar Land Rover* from (a) introducing AEB with a higher functionality than that set forth in this document; (b) making AEB standard on all vehicles earlier than the commitment in this document; or (c) using any technology we independently choose to satisfy the AEB performance standards. Moreover, nothing in this document is intended to prevent *Jaguar Land Rover* from developing new or different braking technologies in the future. Finally, nothing in this commitment prevents NHTSA or IIHS from pursuing other initiatives to advance the performance of AEB systems or from Jaguar Land Rover meeting its statutory responsibility under Federal law.

1. DEFINITION OF AEB FUNCTIONALITY

AEB functionality for the purposes of this commitment, along with the associated test procedures, are set forth in this section. We note that AEB technology is evolving, and this commitment will not stand in the way of the development of systems with greater functionality. As such, the level of functionality and test protocols described herein are intended to identify the minimum level of functionality needed to

meet the conditions of this commitment, and nothing will prevent *Jaguar Land Rover* from offering more advanced technologies.

An AEB system satisfying the terms of this commitment shall have two features, FCW and CIB.

A. Forward Collision Warning

AEB systems conforming to this commitment will include an FCW system that, when tested according to the procedures described in NHTSA's **Forward Collision Warning System Confirmation Test, February 2013²** (the "NHTSA FCW Test"), meets the **Alert Criteria** for tests 2 and 3. Specifically, as set forth in Section 12.3 of the NHTSA FCW Test, "**Test 2 – Subject Vehicle Encounters Decelerating Principal Other Vehicle**" specifies that the FCW alert shall be issued when the time-to-collision (TTC) is at least 2.4 seconds under the conditions set forth in that test. As set forth in Section 12.4 of the NHTSA FCW Test, "**Test 3 – Subject Vehicle Encounters Slower Principal Other Vehicle**" specifies that the FCW alert shall be issued when the time-to-collision (TTC) is at least 2.0 seconds under the conditions set forth in that test.³

B. Crash Imminent Braking

AEB systems conforming to this commitment will also include a CIB system that, when tested according to the procedures described in IIHS's **Autonomous Emergency Braking Test Protocol (Version I), October 2013⁴**, produce speed reductions according to option A or B:

Option A – Average speed reduction across 5 repeated tests that is greater than 10 miles per hour (mph) in either the 12 or 24 mph tests involving a stationary lead vehicle

OR

Option B – Average speed reduction across 5 repeated tests that is greater than 5 mph in both the 12 and 24 mph tests involving a stationary lead vehicle.

2. APPLICABILITY

² Available at www.safercar.gov/staticfiles/safercar/NCAP/FCW_NCAP_Test_Procedure_2-7-2013.pdf

³ The requirements described in section 12.2 of the NHTSA FCW Test, "**Test 1 – Subject Vehicle Encounters Stopped Principal Other Vehicle,**" are not included as part of this MOU.

⁴ Available at http://www.iihs.org/media/a582abfb-7691-4805-81aa-16bbdf622992/-2036166062/Ratings/Protocols/current/test_protocol_aeb.pdf

Jaguar Land Rover independently and voluntarily commits to make AEB technology conforming to Sections 1.A and 1.B of this document standard equipment in substantially all light-duty vehicles and trucks (i.e., those with a gross vehicle weight rating (GVWR) of 10,000 pounds or less) sold in the United States no later than the realization year set forth below. For the purposes of this commitment “substantially all” light-duty vehicles and trucks means 95 percent of vehicles intended for sale in the United States and manufactured⁵ beginning on September 1 of the realization year through August 31 of the following year. In addition, we may elect to exempt from being counted for the purposes of conformance with this commitment (a) vehicles manufactured for use as police or other emergency services vehicles, and/or (b) vehicles with re-design or end-of-life cycles occurring within 12 months of the realization date, so long as the redesigned vehicle is equipped with conforming standard AEB or the original vehicle is not replaced.

3. TIME FRAME FOR REALIZATION OF STANDARD AEB

Jaguar Land Rover, who independently and voluntarily commits to make AEB technology, as described in this document, a standard feature on substantially all light duty vehicles and trucks in the following realization years:

- A. For light duty vehicles and trucks 8,500 lbs. GVWR or less: no later than 2022 (i.e., manufactured beginning on September 1, 2022, through August 31, 2023); and
- B. For light duty vehicles and trucks between 8,501 and 10,000 lbs. GVWR: no later than 2025 (i.e., manufactured beginning on September 1, 2025, through August 31, 2026).

Additionally, we may, at our option, initially exempt vehicles with manual transmissions from being counted towards the 2022 realization date, and instead voluntarily make AEB standard equipment on substantially all such vehicles no later than 2024 (i.e., manufactured beginning on September 1, 2024, through August 31, 2025).

4. MONITORING PROGRESS TOWARD STANDARD AEB

NHTSA has kept the public informed about this activity through the public docket (No. NHTSA-2015-0101). Beginning in 2017, *Jaguar Land Rover* will voluntarily submit to the public docket by October 31 of each year an annual report setting forth the proportion of vehicles manufactured for sale in the United States beginning on September 1 of the previous year through August 31 of the current year that

⁵ A vehicle’s manufacturer shall be defined based on the badging/brand of the vehicle, regardless of which company may have manufactured the vehicle.

conform to the specifications of this document. Once we have demonstrated conformance with this commitment, we will no longer submit such reports to the public docket, and expect to be deemed as having fulfilled our obligations under this commitment. To increase consumer awareness, IIHS and NHTSA agree to occasionally publish progress reports, including lists of the year\make\models of vehicles with standard AEB as defined in these principles. Likewise, *Jaguar Land Rover* will make efforts to inform its customers about the availability of standard AEB in their product lines.

A Commitment to Advancing Automatic Emergency Braking Technology

INTRODUCTION

New and advanced driver assistance systems that are intended to help drivers avoid crashes are quickly entering the motor vehicle marketplace in the United States. These systems utilize outward-looking sensors to gather information about a wide range of possible hazards associated with crashes and employ various interventions — warning, automated braking, automated steering, etc. — to assist drivers. Many crash avoidance systems are typically offered to consumers as optional content on new vehicles.

One category of crash avoidance system is known as Automatic Emergency Braking (AEB). AEB consists of a Forward Collision Warning (FCW) function designed to detect vehicles or objects ahead and alert a driver of an impending collision, coupled with Crash Imminent Braking (CIB), which provides automatic braking when forward-looking sensors indicate a crash is imminent and the driver is not reacting.

Since 2011, a growing body of research suggests that AEB systems have been beneficial in preventing or mitigating some crashes and resulting injuries and property damage. Various studies have found specific crash reductions associated with various implementations of AEB technology on a variety of vehicle types.¹ In light of such studies, on September 11, 2015, the National Highway Traffic Safety Administration (NHTSA) and the Insurance Institute for Highway Safety (IIHS) called upon automakers to convene a working group to discuss how to best advance these technologies in the near term. This document is the product of such discussions and, although the specific reductions may vary from the results found in the studies footnoted here, there is a general expectation that the fleet wide implementation of the basic performance requirements contained in this document will reduce overall crashes in the relevant crash scenarios.

¹ See Highway Loss Data Institute Bulletin Vol. 28 No. 6 **Volvo City Safety loss experience — initial results** available at www.iihs.org; Highway Loss Data Institute Bulletin Vol. 32 No. 1 **Volvo City Safety loss experience – a long term update** available at www.iihs.org; Highway Loss Data Institute Bulletin Vol. 32 No. 13 **Volvo City Safety loss experience by vehicle ages** available at www.iihs.org; **Effectiveness of low speed autonomous emergency braking in real-world rear-end crashes**; Fildes, B. et al. *Accident Analysis and Prevention*, August 2015; **Real world performance of City Safety based on Swedish insurance data**; Isaksson-Hellman, I. and Lindman, M. & **AEB real world validation using UK motor insurance claims data**; Doyle, M. et al. in *Proceedings of 2015 Enhanced Safety of Vehicles Conference*; Highway Loss Data Institute Bulletins Vol. 28 No. 21 (Acura), Vol. 29 No. 5 (Volvo) & No. 7 (Mercedes-Benz), Vol. 31 no. 2 (Honda), Vol. 32 Nos. 7, 8, 22, 33 (Honda, Subaru, Mazda, Honda respectively) available at www.iihs.org; **Effectiveness of forward collision warning systems with and without autonomous emergency braking in reducing police-reported crash rates**; Cicchino, J.B., January 2016 available at www.iihs.org; **Effectiveness of Volvo's City Safety low-speed autonomous emergency braking system in reducing police-reported crash rates**; Cicchino, J.B., January 2016 available at www.iihs.org.

The AEB systems for which benefits have been documented do have limitations. Many current AEB systems activate only in front-to-rear crash scenarios. They also may have other technological limitations, such as a narrow range of operating speeds or sensors that are adversely affected by weather conditions, dirt or harsh lighting conditions. Additionally, despite extensive testing by automakers, it is possible that customers could experience unique situations resulting in unwarranted interventions by the systems. These occurrences are expected to be infrequent and have a minimal influence on the greater benefits of these systems.

(Kia Motors) **independently** and **voluntarily** commits to make AEB systems a standard feature on substantially all new vehicles (as set forth in this document) by the realization date(s) listed below. Nothing in this document prevents *(Kia Motors)* from (a) introducing AEB with a higher functionality than that set forth in this document; (b) making AEB standard on all vehicles earlier than the commitment in this document; or (c) using any technology we independently choose to satisfy the AEB performance standards. Moreover, nothing in this document is intended to prevent *(Kia Motors)* from developing new or different braking technologies in the future. Finally, nothing in this commitment prevents or is intended to prevent: (a) NHTSA or IIHS from pursuing other initiatives to advance the performance of AEB systems or (b) *(Kia Motors)* meeting its statutory or regulatory obligations under Federal law.

1. DEFINITION OF AEB FUNCTIONALITY

AEB functionality for the purposes of this commitment, along with the associated test procedures, are set forth in this section. We note that AEB technology is evolving, and this commitment will not stand in the way of the development of systems with greater functionality. As such, the level of functionality and test protocols described herein are intended to identify the minimum level of functionality needed to meet the conditions of this commitment, and nothing will prevent *(Kia Motors)* from offering more advanced technologies.

An AEB system satisfying the terms of this commitment shall have two features, FCW and CIB.

A. Forward Collision Warning

AEB systems conforming to this commitment will include an FCW system that, when tested according to the procedures described in NHTSA's **Forward Collision Warning System Confirmation Test, February**

2013² (the “NHTSA FCW Test”), meets the **Alert Criteria** for tests 2 and 3. Specifically, as set forth in Section 12.3 of the NHTSA FCW Test, “**Test 2 – Subject Vehicle Encounters Decelerating Principal Other Vehicle**” specifies that the FCW alert shall be issued when the time-to-collision (TTC) is at least 2.4 seconds under the conditions set forth in that test. As set forth in Section 12.4 of the NHTSA FCW Test, “**Test 3 – Subject Vehicle Encounters Slower Principal Other Vehicle**” specifies that the FCW alert shall be issued when the time-to-collision (TTC) is at least 2.0 seconds under the conditions set forth in that test.³

B. Crash Imminent Braking

AEB systems conforming to this commitment will also include a CIB system that, when tested according to the procedures described in IIHS’s **Autonomous Emergency Braking Test Protocol (Version I), October 2013⁴**, produce speed reductions according to option A or B:

Option A – Average speed reduction across 5 repeated tests that is greater than 10 miles per hour (mph) in either the 12 or 24 mph tests involving a stationary lead vehicle

OR

Option B – Average speed reduction across 5 repeated tests that is greater than 5 mph in both the 12 and 24 mph tests involving a stationary lead vehicle.

2. APPLICABILITY

(*Kia Motors*) independently and voluntarily commits to make AEB technology conforming to Sections 1.A and 1.B of this document standard equipment in substantially all light-duty vehicles and trucks (i.e., those with a gross vehicle weight rating (GVWR) of 10,000 pounds or less) sold in the United States no later than the realization year set forth below. For the purposes of this commitment “substantially all” light-duty vehicles and trucks means 95 percent of vehicles intended for sale in the United States and manufactured⁵ beginning on September 1 of the realization year through August 31 of the following

² Available at www.safercar.gov/staticfiles/safercar/NCAP/FCW_NCAP_Test_Procedure_2-7-2013.pdf

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⁵ Vehicles badged/branded as (*Name of automaker*) products, regardless of which other company may have manufactured them.

year. In addition, we may elect to exempt from being counted for the purposes of conformance with this commitment (a) vehicles manufactured for use as police or other emergency services vehicles, and/or (b) vehicles with re-design or end-of-life cycles occurring within 12 months of the realization date, so long as the redesigned vehicle is equipped with conforming standard AEB or the original vehicle is not replaced.

3. TIME FRAME FOR REALIZATION OF STANDARD AEB

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Via email

Nathaniel Beuse, Associate Administrator
Vehicle Safety Research

National Highway Traffic Safety Administration
1200 New Jersey Avenue, SE
Washington, DC 20590-0001

David Zuby, Executive Vice President &
Chief Research Officer

Insurance Institute for Highway Safety (IIHS)
988 Dairy Road
Ruckersville, VA 22968

March 18, 2016

Re: Automatic Emergency Braking (AEB)

Dear Mr. Beuse and Mr. Zuby;

As per your instructions, Maserati North America, Inc., on behalf of Maserati S.p.A. intends to conform with the attached plan, and appreciates the efforts of both NHTSA and IIHS on this critical issue.

Sincerely,

Daniel Doku
Manager, Certification & Compliance Department
Maserati North America, Inc.
270 Sylvan Avenue
Englewood Cliffs, NJ
Tel: (201) 816-2638
ddoku@maseratiusa.com

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An FCA Company

A Commitment to Advancing Automatic Emergency Braking Technology

INTRODUCTION

New and advanced driver assistance systems that are intended to help drivers avoid crashes are quickly entering the motor vehicle marketplace in the United States. These systems utilize outward-looking sensors to gather information about a wide range of possible hazards associated with crashes and employ various interventions — warning, automated braking, automated steering, etc. — to assist drivers. Many crash avoidance systems are typically offered to consumers as optional content on new vehicles.

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(Name of automaker) **independently** and **voluntarily** commits to make AEB systems a standard feature on substantially all new vehicles (as set forth in this document) by the realization date(s) listed below. Nothing in this document prevents *(Name of automaker)* from (a) introducing AEB with a higher functionality than that set forth in this document; (b) making AEB standard on all vehicles earlier than the commitment in this document; or (c) using any technology we independently choose to satisfy the AEB performance standards. Moreover, nothing in this document is intended to prevent *(Name of automaker)* from developing new or different braking technologies in the future. Finally, nothing in this commitment prevents or is intended to prevent: (a) NHTSA or IIHS from pursuing other initiatives to advance the performance of AEB systems or (b) *(Name of automaker)* meeting its statutory or regulatory obligations under Federal law.

1. DEFINITION OF AEB FUNCTIONALITY

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2013² (the “NHTSA FCW Test”), meets the **Alert Criteria** for tests 2 and 3. Specifically, as set forth in Section 12.3 of the NHTSA FCW Test, “**Test 2 – Subject Vehicle Encounters Decelerating Principal Other Vehicle**” specifies that the FCW alert shall be issued when the time-to-collision (TTC) is at least 2.4 seconds under the conditions set forth in that test. As set forth in Section 12.4 of the NHTSA FCW Test, “**Test 3 – Subject Vehicle Encounters Slower Principal Other Vehicle**” specifies that the FCW alert shall be issued when the time-to-collision (TTC) is at least 2.0 seconds under the conditions set forth in that test.³

B. Crash Imminent Braking

AEB systems conforming to this commitment will also include a CIB system that, when tested according to the procedures described in IIHS’s **Autonomous Emergency Braking Test Protocol (Version I), October 2013⁴**, produce speed reductions according to option A or B:

Option A – Average speed reduction across 5 repeated tests that is greater than 10 miles per hour (mph) in either the 12 or 24 mph tests involving a stationary lead vehicle

OR

Option B – Average speed reduction across 5 repeated tests that is greater than 5 mph in both the 12 and 24 mph tests involving a stationary lead vehicle.

2. APPLICABILITY

(*Name of automaker*) independently and voluntarily commits to make AEB technology conforming to Sections 1.A and 1.B of this document standard equipment in substantially all light-duty vehicles and trucks (i.e., those with a gross vehicle weight rating (GVWR) of 10,000 pounds or less) sold in the United States no later than the realization year set forth below. For the purposes of this commitment “substantially all” light-duty vehicles and trucks means 95 percent of vehicles intended for sale in the United States and manufactured⁵ beginning on September 1 of the realization year through August 31 of

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⁴ Available at http://www.iihs.org/media/a582abfb-7691-4805-81aa-16bbdf622992/-2036166062/Ratings/Protocols/current/test_protocol_aeb.pdf

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the following year. In addition, we may elect to exempt from being counted for the purposes of conformance with this commitment (a) vehicles manufactured for use as police or other emergency services vehicles, and/or (b) vehicles with re-design or end-of-life cycles occurring within 12 months of the realization date, so long as the redesigned vehicle is equipped with conforming standard AEB or the original vehicle is not replaced.

3. TIME FRAME FOR REALIZATION OF STANDARD AEB

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Additionally, we may, at our option, initially exempt vehicles with manual transmissions from being counted towards the 2022 realization date, and instead voluntarily make AEB standard equipment on substantially all such vehicles no later than 2024 (i.e., manufactured beginning on September 1, 2024, through August 31, 2025).

4. MONITORING PROGRESS TOWARD STANDARD AEB

NHTSA has kept the public informed about this activity through the public docket (No. NHTSA-2015-0101). Beginning in 2017, (*Name of automaker*) will voluntarily submit to the public docket by October 31 of each year an annual report setting forth the proportion of vehicles manufactured for sale in the United States beginning on September 1 of the previous year through August 31 of the current year that conform to the specifications of this document. Once we have demonstrated conformance with this commitment, we will no longer submit such reports to the public docket, and expect to be deemed as having fulfilled our obligations under this commitment. To increase consumer awareness, IIHS and NHTSA agree to occasionally publish progress reports, including lists of the year\make\models of vehicles with standard AEB as defined in these principles. Likewise, (*Name of automaker*) will make efforts to inform its customers about the availability of standard AEB in their product lines.



2017 2017

A Commitment to Advancing Automatic Emergency Braking Technology

INTRODUCTION

New and advanced driver assistance systems that are intended to help drivers avoid crashes are quickly entering the motor vehicle marketplace in the United States. These systems utilize outward-looking sensors to gather information about a wide range of possible hazards associated with crashes and employ various interventions — warning, automated braking, automated steering, etc. — to assist drivers. Many crash avoidance systems are typically offered to consumers as optional content on new vehicles.

One category of crash avoidance system is known as Automatic Emergency Braking (AEB). AEB consists of a Forward Collision Warning (FCW) function designed to detect vehicles or objects ahead and alert a driver of an impending collision, coupled with Crash Imminent Braking (CIB), which provides automatic braking when forward-looking sensors indicate a crash is imminent and the driver is not reacting.

Since 2011, a growing body of research suggests that AEB systems have been beneficial in preventing or mitigating some crashes and resulting injuries and property damage. Various studies have found specific crash reductions associated with various implementations of AEB technology on a variety of vehicle types.¹ In light of such

¹ See Highway Loss Data Institute Bulletin Vol. 28 No. 6 **Volvo City Safety loss experience — initial results** available at www.iihs.org; Highway Loss Data Institute Bulletin Vol. 32 No. 1 **Volvo City Safety loss experience — a long term update**

studies, on September 11, 2015, the National Highway Traffic Safety Administration (NHTSA) and the Insurance Institute for Highway Safety (IIHS) called upon automakers to convene a working group to discuss how to best advance these technologies in the near term. This document is the product of such discussions and, although the specific reductions may vary from the results found in the studies footnoted here, there is a general expectation that the fleet wide implementation of the basic performance requirements contained in this document will reduce overall crashes in the relevant crash scenarios.

The AEB systems for which benefits have been documented do have limitations. Many current AEB systems activate only in front-to-rear crash scenarios. They also may have other technological limitations, such as a narrow range of operating speeds or sensors that are adversely affected by weather conditions, dirt or harsh lighting conditions. Additionally, despite extensive testing by automakers, it is possible that customers could experience unique situations resulting in unwarranted interventions by the systems.

available at www.iihs.org; Highway Loss Data Institute Bulletin Vol. 32 No. 13
Volvo City Safety loss experience by vehicle ages available at www.iihs.org;
Effectiveness of low speed autonomous emergency braking in real-world rear-end crashes; Fildes, B. et al. *Accident Analysis and Prevention*, August 2015; **Real world performance of City Safety based on Swedish insurance data**; Isaksson-Hellman, I. and Lindman, M. & **AEB real world validation using UK motor insurance claims data**; Doyle, M. et al. in *Proceedings of 2015 Enhanced Safety of Vehicles Conference*; Highway Loss Data Institute Bulletins Vol. 28 No. 21 (Acura), Vol. 29 No. 5 (Volvo) & No. 7 (Mercedes-Benz), Vol. 31 no. 2 (Honda), Vol. 32 Nos. 7, 8, 22, 33 (Honda, Subaru, Mazda, Honda respectively) available at www.iihs.org;
Effectiveness of forward collision warning systems with and without autonomous emergency braking in reducing police-reported crash rates; Cicchino, J.B., January 2016 available at www.iihs.org; **Effectiveness of Volvo's City Safety low-speed autonomous emergency braking system in reducing police-reported crash rates**; Cicchino, J.B., January 2016 available at www.iihs.org.

These occurrences are expected to be infrequent and have a minimal influence on the greater benefits of these systems.

Mazda North American Operations independently and voluntarily commits to make AEB systems a standard feature on substantially all new vehicles (as set forth in this document) by the realization date(s) listed below. Nothing in this document prevents Mazda North American Operations from (a) introducing AEB with a higher functionality than that set forth in this document; (b) making AEB standard on all vehicles earlier than the commitment in this document; or (c) using any technology we independently choose to satisfy the AEB performance standards. Moreover, nothing in this document is intended to prevent Mazda North American Operations from developing new or different braking technologies in the future. Finally, nothing in this commitment prevents or is intended to prevent: (a) NHTSA or IIHS from pursuing other initiatives to advance the performance of AEB systems or (b) Mazda North American Operations meeting its statutory or regulatory obligations under Federal law.

1. DEFINITION OF AEB FUNCTIONALITY

AEB functionality for the purposes of this commitment, along with the associated test procedures, are set forth in this section. We note that AEB technology is evolving, and this commitment will not stand in the way of the development of systems with greater functionality. As such, the level of functionality and test protocols described herein are intended to identify the minimum level of functionality needed to meet the conditions of this commitment, and nothing will prevent Mazda North American Operations from offering more advanced technologies.

An AEB system satisfying the terms of this commitment shall have two features, FCW and CIB.

A. Forward Collision Warning

AEB systems conforming to this commitment will include an FCW system that, when tested according to the procedures described in NHTSA's **Forward Collision Warning System Confirmation Test, February 2013**² (the "NHTSA FCW Test"), meets the **Alert Criteria** for tests 2 and 3. Specifically, as set forth in Section 12.3 of the NHTSA FCW Test, "**Test 2 – Subject Vehicle Encounters Decelerating Principal Other Vehicle**" specifies that the FCW alert shall be issued when the time-to-collision (TTC) is at least 2.4 seconds under the conditions set forth in that test. As set forth in Section 12.4 of the NHTSA FCW Test, "**Test 3 – Subject Vehicle Encounters Slower Principal Other Vehicle**" specifies that the FCW alert shall be issued when the time-to-collision (TTC) is at least 2.0 seconds under the conditions set forth in that test.³

B. Crash Imminent Braking

AEB systems conforming to this commitment will also include a CIB system that, when tested according to the procedures described in IIHS's **Autonomous Emergency Braking Test Protocol (Version I), October 2013**⁴, produce speed reductions according to option A or B:

² Available at www.safercar.gov/staticfiles/safercar/NCAP/FCW_NCAP_Test_Procedure_2-7-2013.pdf

³ The requirements described in section 12.2 of the NHTSA FCW Test, "**Test 1 – Subject Vehicle Encounters Stopped Principal Other Vehicle,**" are not included as part of this MOU.

⁴ Available at http://www.iihs.org/media/a582abfb-7691-4805-81aa-16bbdf622992/-2036166062/Ratings/Protocols/current/test_protocol_aeb.pdf

Option A – Average speed reduction across 5 repeated tests that is greater than 10 miles per hour (mph) in either the 12 or 24 mph tests involving a stationary lead vehicle

OR

Option B – Average speed reduction across 5 repeated tests that is greater than 5 mph in both the 12 and 24 mph tests involving a stationary lead vehicle.

2. APPLICABILITY

Mazda North American Operations independently and voluntarily commits to make AEB technology conforming to Sections 1.A and 1.B of this document standard equipment in substantially all light-duty vehicles and trucks (i.e., those with a gross vehicle weight rating (GVWR) of 10,000 pounds or less) sold in the United States no later than the realization year set forth below. For the purposes of this commitment “substantially all” light-duty vehicles and trucks means 95 percent of vehicles intended for sale in the United States and manufactured⁵ beginning on September 1 of the realization year through August 31 of the following year. In addition, we may elect to exempt from being counted for the purposes of conformance with this commitment (a) vehicles manufactured for use as police or other emergency services vehicles, and/or (b) vehicles with re-design or end-of-life cycles occurring within 12 months of the realization date, so long as the redesigned vehicle is equipped with conforming standard AEB or the original vehicle is not replaced.

3. TIME FRAME FOR REALIZATION OF STANDARD AEB

Mazda North American Operations who independently and voluntarily commits to make AEB technology, as described in this document, a standard feature on substantially all light duty vehicles and trucks in the following realization years:

⁵ Vehicles badged/branded as (*Name of automaker*) products, regardless of which other company may have manufactured them.

- A. For light duty vehicles and trucks 8,500 lbs. GVWR or less: no later than 2022 (i.e., manufactured beginning on September 1, 2022, through August 31, 2023); and
- B. For light duty vehicles and trucks between 8,501 and 10,000 lbs. GVWR: no later than 2025 (i.e., manufactured beginning on September 1, 2025, through August 31, 2026).

Additionally, we may, at our option, initially exempt vehicles with manual transmissions from being counted towards the 2022 realization date, and instead voluntarily make AEB standard equipment on substantially all such vehicles no later than 2024 (i.e., manufactured beginning on September 1, 2024, through August 31, 2025).

4. MONITORING PROGRESS TOWARD STANDARD AEB

NHTSA has kept the public informed about this activity through the public docket (No. NHTSA-2015-0101). Beginning in 2017, Mazda North American Operations will voluntarily submit to the public docket by October 31 of each year an annual report setting forth the proportion of vehicles manufactured for sale in the United States beginning on September 1 of the previous year through August 31 of the current year that conform to the specifications of this document. Once we have demonstrated conformance with this commitment, we will no longer submit such reports to the public docket, and expect to be deemed as having fulfilled our obligations under this commitment. To increase consumer awareness, IIHS and NHTSA agree to occasionally publish progress reports, including lists of the year's make models of vehicles with standard AEB as defined in these principles. Likewise, Mazda North American Operations will make efforts to inform its customers about the availability of standard AEB in their product lines.



Mercedes-Benz

A Commitment to Advancing Automatic Emergency Braking Technology

INTRODUCTION

New and advanced driver assistance systems that are intended to help drivers avoid crashes are quickly entering the motor vehicle marketplace in the United States. These systems utilize outward-looking sensors to gather information about a wide range of possible hazards associated with crashes and employ various interventions — warning, automated braking, automated steering, etc. — to assist drivers. Many crash avoidance systems are typically offered to consumers as optional content on new vehicles.

One category of crash avoidance system is known as Automatic Emergency Braking (AEB). AEB consists of a Forward Collision Warning (FCW) function designed to detect vehicles or objects ahead and alert a driver of an impending collision, coupled with Crash Imminent Braking (CIB), which provides automatic braking when forward-looking sensors indicate a crash is imminent and the driver is not reacting.

Since 2011, a growing body of research suggests that AEB systems have been beneficial in preventing or mitigating some crashes and resulting injuries and property damage. Various studies have found specific crash reductions associated with various implementations of AEB technology on a variety of vehicle types.¹ In light of such studies, on September 11, 2015, the National Highway Traffic Safety Administration (NHTSA) and the Insurance Institute for Highway Safety (IIHS) called upon automakers to convene a working group to discuss how to best advance these technologies in the near term. This document is the product of such discussions and, although the specific reductions may vary from the results found in the studies footnoted here, there is a general expectation that the fleet wide

¹ See Highway Loss Data Institute Bulletin Vol. 28 No. 6 **Volvo City Safety loss experience — initial results** available at www.iihs.org; Highway Loss Data Institute Bulletin Vol. 32 No. 1 **Volvo City Safety loss experience – a long term update** available at www.iihs.org; Highway Loss Data Institute Bulletin Vol. 32 No. 13 **Volvo City Safety loss experience by vehicle ages** available at www.iihs.org; **Effectiveness of low speed autonomous emergency braking in real-world rear-end crashes**; Fildes, B. et al. *Accident Analysis and Prevention*, August 2015; **Real world performance of City Safety based on Swedish insurance data**; Isaksson-Hellman, I. and Lindman, M. & **AEB real world validation using UK motor insurance claims data**; Doyle, M. et al. in *Proceedings of 2015 Enhanced Safety of Vehicles Conference*; Highway Loss Data Institute Bulletins Vol. 28 No. 21 (Acura), Vol. 29 No. 5 (Volvo) & No. 7 (Mercedes-Benz), Vol. 31 no. 2 (Honda), Vol. 32 Nos. 7, 8, 22, 33 (Honda, Subaru, Mazda, Honda respectively) available at www.iihs.org; **Effectiveness of forward collision warning systems with and without autonomous emergency braking in reducing police-reported crash rates**; Cicchino, J.B., January 2016 available at www.iihs.org; **Effectiveness of Volvo’s City Safety low-speed autonomous emergency braking system in reducing police-reported crash rates**; Cicchino, J.B., January 2016 available at www.iihs.org.

implementation of the basic performance requirements contained in this document will reduce overall crashes in the relevant crash scenarios.

The AEB systems for which benefits have been documented do have limitations. Many current AEB systems activate only in front-to-rear crash scenarios. They also may have other technological limitations, such as a narrow range of operating speeds or sensors that are adversely affected by weather conditions, dirt or harsh lighting conditions. Additionally, despite extensive testing by automakers, it is possible that customers could experience unique situations resulting in unwarranted interventions by the systems. These occurrences are expected to be infrequent and have a minimal influence on the greater benefits of these systems.

Mercedes-Benz USA, LLC (MBUSA) **independently** and **voluntarily** commits to make AEB systems a standard feature on substantially all new vehicles (as set forth in this document) by the realization date(s) listed below. Nothing in this document prevents MBUSA from (a) introducing AEB with a higher functionality than that set forth in this document; (b) making AEB standard on all vehicles earlier than the commitment in this document; or (c) using any technology we independently choose to satisfy the AEB performance standards. Moreover, nothing in this document is intended to prevent *MBUSA* from developing new or different braking technologies in the future. Finally, nothing in this commitment prevents NHTSA or IIHS from pursuing other initiatives to advance the performance of AEB systems or from MBUSA meeting its statutory responsibility under Federal law.

1. DEFINITION OF AEB FUNCTIONALITY

AEB functionality for the purposes of this commitment, along with the associated test procedures, are set forth in this section. We note that AEB technology is evolving, and this commitment will not stand in the way of the development of systems with greater functionality. As such, the level of functionality and test protocols described herein are intended to identify the minimum level of functionality needed to meet the conditions of this commitment, and nothing will prevent MBUSA from offering more advanced technologies.

An AEB system satisfying the terms of this commitment shall have two features, FCW and CIB.

A. Forward Collision Warning

AEB systems conforming to this commitment will include an FCW system that, when tested according to the procedures described in NHTSA's **Forward Collision Warning System Confirmation Test, February**

2013² (the “NHTSA FCW Test”), meets the **Alert Criteria** for tests 2 and 3. Specifically, as set forth in Section 12.3 of the NHTSA FCW Test, “**Test 2 – Subject Vehicle Encounters Decelerating Principal Other Vehicle**” specifies that the FCW alert shall be issued when the time-to-collision (TTC) is at least 2.4 seconds under the conditions set forth in that test. As set forth in Section 12.4 of the NHTSA FCW Test, “**Test 3 – Subject Vehicle Encounters Slower Principal Other Vehicle**” specifies that the FCW alert shall be issued when the time-to-collision (TTC) is at least 2.0 seconds under the conditions set forth in that test.³

B. Crash Imminent Braking

AEB systems conforming to this commitment will also include a CIB system that, when tested according to the procedures described in IIHS’s **Autonomous Emergency Braking Test Protocol (Version I), October 2013⁴**, produce speed reductions according to option A or B:

Option A – Average speed reduction across 5 repeated tests that is greater than 10 miles per hour (mph) in either the 12 or 24 mph tests involving a stationary lead vehicle

OR

Option B – Average speed reduction across 5 repeated tests that is greater than 5 mph in both the 12 and 24 mph tests involving a stationary lead vehicle.

2. APPLICABILITY

MBUSA independently and voluntarily commits to make AEB technology conforming to Sections 1.A and 1.B of this document standard equipment in substantially all light-duty vehicles and trucks (i.e., those with a gross vehicle weight rating (GVWR) of 10,000 pounds or less) sold in the United States no later than the realization year set forth below. For the purposes of this commitment “substantially all” light-duty vehicles and trucks means 95 percent of vehicles intended for sale in the United States and manufactured⁵ beginning on September 1 of the realization year through August 31 of the following year. In addition, we may elect to exempt from being counted for the purposes of conformance with this

² Available at www.safercar.gov/staticfiles/safercar/NCAP/FCW_NCAP_Test_Procedure_2-7-2013.pdf

³ The requirements described in section 12.2 of the NHTSA FCW Test, “**Test 1 – Subject Vehicle Encounters Stopped Principal Other Vehicle,**” are not included as part of this MOU.

⁴ Available at http://www.iihs.org/media/a582abfb-7691-4805-81aa-16bbdf622992/-2036166062/Ratings/Protocols/current/test_protocol_aeb.pdf

⁵ A vehicle’s manufacturer shall be defined based on the badging/brand of the vehicle, regardless of which company may have manufactured the vehicle.

commitment (a) vehicles manufactured for use as police or other emergency services vehicles, and/or (b) vehicles with re-design or end-of-life cycles occurring within 12 months of the realization date, so long as the redesigned vehicle is equipped with conforming standard AEB or the original vehicle is not replaced.

3. TIME FRAME FOR REALIZATION OF STANDARD AEB

MBUSA, who independently and voluntarily commits to make AEB technology, as described in this document, a standard feature on substantially all light duty vehicles and trucks in the following realization years:

- A. For light duty vehicles and trucks 8,500 lbs. GVWR or less: no later than 2022 (i.e., manufactured beginning on September 1, 2022, through August 31, 2023); and
- B. For light duty vehicles and trucks between 8,501 and 10,000 lbs. GVWR: no later than 2025 (i.e., manufactured beginning on September 1, 2025, through August 31, 2026).

Additionally, we may, at our option, initially exempt vehicles with manual transmissions from being counted towards the 2022 realization date, and instead voluntarily make AEB standard equipment on substantially all such vehicles no later than 2024 (i.e., manufactured beginning on September 1, 2024, through August 31, 2025).

4. MONITORING PROGRESS TOWARD STANDARD AEB

NHTSA has kept the public informed about this activity through the public docket (No. NHTSA-2015-0101). Beginning in 2017, MBUSA will voluntarily submit to the public docket by October 31 of each year an annual report setting forth the proportion of vehicles manufactured for sale in the United States beginning on September 1 of the previous year through August 31 of the current year that conform to the specifications of this document. Once we have demonstrated conformance with this commitment, we will no longer submit such reports to the public docket, and expect to be deemed as having fulfilled our obligations under this commitment. To increase consumer awareness, IIHS and NHTSA agree to occasionally publish progress reports, including lists of the year's models of vehicles with standard AEB as defined in these principles. Likewise, MBUSA will make efforts to inform its customers about the availability of standard AEB in their product lines.

Mitsubishi Motors Commitment to Advancing Automatic Emergency Braking Technology

INTRODUCTION

New and advanced driver assistance systems that are intended to help drivers avoid crashes are quickly entering the motor vehicle marketplace in the United States. These systems utilize outward-looking sensors to gather information about a wide range of possible hazards associated with crashes and employ various interventions — warning, automated braking, automated steering, etc. — to assist drivers. Many crash avoidance systems are typically offered to consumers as optional content on new vehicles.

One category of crash avoidance system is known as Automatic Emergency Braking (AEB). AEB consists of a Forward Collision Warning (FCW) function designed to detect vehicles or objects ahead and alert a driver of an impending collision, coupled with Crash Imminent Braking (CIB), which provides automatic braking when forward-looking sensors indicate a crash is imminent and the driver is not reacting.

Since 2011, a growing body of research suggests that AEB systems have been beneficial in preventing or mitigating some crashes and resulting injuries and property damage.

Various studies have found specific crash reductions associated with various implementations of AEB technology on a variety of vehicle types.¹ In light of such studies, on September 11, 2015, the National Highway Traffic Safety Administration (NHTSA) and the Insurance Institute for Highway Safety (IIHS) called upon automakers

¹ See Highway Loss Data Institute Bulletin Vol. 28 No. 6 **Volvo City Safety loss experience — initial results** available at www.iihs.org; Highway Loss Data Institute Bulletin Vol. 32 No. 1 **Volvo City Safety loss experience – a long term update** available at www.iihs.org; Highway Loss Data Institute Bulletin Vol. 32 No. 13 **Volvo City Safety loss experience by vehicle ages** available at www.iihs.org; **Effectiveness of low speed autonomous emergency braking in real-world rear-end crashes**; Fildes, B. et al. *Accident Analysis and Prevention*, August 2015; **Real world performance of City Safety based on Swedish insurance data**; Isaksson-Hellman, I. and Lindman, M. & **AEB real world validation using UK motor insurance claims data**; Doyle, M. et al. in *Proceedings of 2015 Enhanced Safety of Vehicles Conference*; Highway Loss Data Institute Bulletins Vol. 28 No. 21 (Acura), Vol. 29 No. 5 (Volvo) & No. 7 (Mercedes-Benz), Vol. 31 no. 2 (Honda), Vol. 32 Nos. 7, 8, 22, 33 (Honda, Subaru, Mazda, Honda respectively) available at www.iihs.org; **Effectiveness of forward collision warning systems with and without autonomous emergency braking in reducing police-reported crash rates**; Cicchino, J.B., January 2016 available at www.iihs.org; **Effectiveness of Volvo’s City Safety low-speed autonomous emergency braking system in reducing police-reported crash rates**; Cicchino, J.B., January 2016 available at www.iihs.org.

to convene a working group to discuss how to best advance these technologies in the near term. This document is the product of such discussions and, although the specific reductions may vary from the results found in the studies footnoted here, there is a general expectation that the fleet wide implementation of the basic performance requirements contained in this document will reduce overall crashes in the relevant crash scenarios.

The AEB systems for which benefits have been documented do have limitations. Many current AEB systems activate only in front-to-rear crash scenarios. They also may have other technological limitations, such as a narrow range of operating speeds or sensors that are adversely affected by weather conditions, dirt or harsh lighting conditions.

Additionally, despite extensive testing by automakers, it is possible that customers could experience unique situations resulting in unwarranted interventions by the systems. These occurrences are expected to be infrequent and have a minimal influence on the greater benefits of these systems.

MITSUBISHI MOTORS **independently** and **voluntarily** commits to make AEB systems a standard feature on substantially all new vehicles (as set forth in this document) by the realization date(s) listed below. Nothing in this document prevents MITSUBISHI MOTORS from (a) introducing AEB with a higher functionality than that set forth in this document; (b) making AEB standard on all vehicles earlier than the commitment in this document; or (c) using any technology we independently choose to satisfy the AEB performance standards. Moreover, nothing in this document is intended to prevent MITSUBISHI MOTORS from developing new or different braking technologies in the future. Finally, nothing in this commitment prevents or is intended to prevent: (a) NHTSA or IIHS from pursuing other initiatives to advance the performance of AEB systems or (b) MITSUBISHI MOTORS meeting its statutory or regulatory obligations under Federal law.

1. DEFINITION OF AEB FUNCTIONALITY

AEB functionality for the purposes of this commitment, along with the associated test procedures, are set forth in this section. We note that AEB technology is evolving, and this commitment will not stand in the way of the development of systems with greater

functionality. As such, the level of functionality and test protocols described herein are intended to identify the minimum level of functionality needed to meet the conditions of this commitment, and nothing will prevent MITSUBISHI MOTORS from offering more advanced technologies.

An AEB system satisfying the terms of this commitment shall have two features, FCW and CIB.

A. Forward Collision Warning

AEB systems conforming to this commitment will include an FCW system that, when tested according to the procedures described in NHTSA's **Forward Collision Warning System Confirmation Test, February 2013²** (the "NHTSA FCW Test"), meets the **Alert Criteria** for tests 2 and 3. Specifically, as set forth in Section 12.3 of the NHTSA FCW Test, "**Test 2 – Subject Vehicle Encounters Decelerating Principal Other Vehicle**" specifies that the FCW alert shall be issued when the time-to-collision (TTC) is at least 2.4 seconds under the conditions set forth in that test. As set forth in Section 12.4 of the NHTSA FCW Test, "**Test 3 – Subject Vehicle Encounters Slower Principal Other Vehicle**" specifies that the FCW alert shall be issued when the time-to-collision (TTC) is at least 2.0 seconds under the conditions set forth in that test.³

B. Crash Imminent Braking

AEB systems conforming to this commitment will also include a CIB system that, when tested according to the procedures described in IIHS's **Autonomous Emergency Braking Test Protocol (Version I), October 2013⁴**, produce speed reductions according to option A or B:

Option A – Average speed reduction across 5 repeated tests that is greater than 10 miles per hour (mph) in either the 12 or 24 mph tests involving a stationary lead vehicle

OR

Option B – Average speed reduction across 5 repeated tests that is greater than 5 mph in both the 12 and 24 mph tests involving a stationary lead vehicle.

² Available at www.safercar.gov/staticfiles/safercar/NCAP/FCW_NCAP_Test_Procedure_2-7-2013.pdf

³ The requirements described in section 12.2 of the NHTSA FCW Test, "**Test 1 – Subject Vehicle Encounters Stopped Principal Other Vehicle**," are not included as part of this MOU.

⁴ Available at http://www.iihs.org/media/a582abfb-7691-4805-81aa-16bbdf622992/-2036166062/Ratings/Protocols/current/test_protocol_aeb.pdf

2. APPLICABILITY

MITSUBISHI MOTORS independently and voluntarily commits to make AEB technology conforming to Sections 1.A and 1.B of this document standard equipment in substantially all light-duty vehicles and trucks (i.e., those with a gross vehicle weight rating (GVWR) of 10,000 pounds or less) sold in the United States no later than the realization year set forth below. For the purposes of this commitment “substantially all” light-duty vehicles and trucks means 95 percent of vehicles intended for sale in the United States and manufactured⁵ beginning on September 1 of the realization year through August 31 of the following year. In addition, we may elect to exempt from being counted for the purposes of conformance with this commitment (a) vehicles manufactured for use as police or other emergency services vehicles, and/or (b) vehicles with re-design or end-of-life cycles occurring within 12 months of the realization date, so long as the redesigned vehicle is equipped with conforming standard AEB or the original vehicle is not replaced.

3. TIME FRAME FOR REALIZATION OF STANDARD AEB

MITSUBISHI MOTORS, who independently and voluntarily commits to make AEB technology, as described in this document, a standard feature on substantially all light duty vehicles and trucks in the following realization years:

- A. For light duty vehicles and trucks 8,500 lbs. GVWR or less: no later than 2022 (i.e., manufactured beginning on September 1, 2022, through August 31, 2023); and
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Additionally, we may, at our option, initially exempt vehicles with manual transmissions from being counted towards the 2022 realization date, and instead voluntarily make AEB

⁵ Vehicles badged/branded as Mitsubishi Motors products, regardless of which other company may have manufactured them.

standard equipment on substantially all such vehicles no later than 2024 (i.e., manufactured beginning on September 1, 2024, through August 31, 2025).

4. MONITORING PROGRESS TOWARD STANDARD AEB

NHTSA has kept the public informed about this activity through the public docket (No. NHTSA-2015-0101). Beginning in 2017, MITSUBISHI MOTORS will voluntarily submit to the public docket by October 31 of each year an annual report setting forth the proportion of vehicles manufactured for sale in the United States beginning on September 1 of the previous year through August 31 of the current year that conform to the specifications of this document. Once we have demonstrated conformance with this commitment, we will no longer submit such reports to the public docket, and expect to be deemed as having fulfilled our obligations under this commitment. To increase consumer awareness, IIHS and NHTSA agree to occasionally publish progress reports, including lists of the year\make\models of vehicles with standard AEB as defined in these principles. Likewise, MITSUBISHI MOTORS will make efforts to inform its customers about the availability of standard AEB in their product lines.



A Commitment to Advancing Automatic Emergency Braking Technology

INTRODUCTION

New and advanced driver assistance systems that are intended to help drivers avoid crashes are quickly entering the motor vehicle marketplace in the United States. These systems utilize outward-looking sensors to gather information about a wide range of possible hazards associated with crashes and employ various interventions — warning, automated braking, automated steering, etc. — to assist drivers. Many crash avoidance systems are typically offered to consumers as optional content on new vehicles.

One category of crash avoidance system is known as Automatic Emergency Braking (AEB). AEB consists of a Forward Collision Warning (FCW) function designed to detect vehicles or objects ahead and alert a driver of an impending collision, coupled with Crash Imminent Braking (CIB), which provides automatic braking when forward-looking sensors indicate a crash is imminent and the driver is not reacting.

Since 2011, a growing body of research suggests that AEB systems have been beneficial in preventing or mitigating some crashes and resulting injuries and property damage. Various studies have found specific crash reductions associated with various implementations of AEB technology on a variety of vehicle types.¹ In light of such studies, on September 11, 2015, the National Highway Traffic Safety Administration (NHTSA) and the Insurance Institute for Highway Safety (IIHS) called upon automakers to convene a working group to discuss how to best advance these technologies in the near term. This document is the product of such discussions and, although the specific reductions may vary from the results found in the studies footnoted here, there is a general expectation that the fleet wide

¹ See Highway Loss Data Institute Bulletin Vol. 28 No. 6 **Volvo City Safety loss experience — initial results** available at www.iihs.org; Highway Loss Data Institute Bulletin Vol. 32 No. 1 **Volvo City Safety loss experience – a long term update** available at www.iihs.org; Highway Loss Data Institute Bulletin Vol. 32 No. 13 **Volvo City Safety loss experience by vehicle ages** available at www.iihs.org; **Effectiveness of low speed autonomous emergency braking in real-world rear-end crashes**; Fildes, B. et al. *Accident Analysis and Prevention*, August 2015; **Real world performance of City Safety based on Swedish insurance data**; Isaksson-Hellman, I. and Lindman, M. & **AEB real world validation using UK motor insurance claims data**; Doyle, M. et al. in *Proceedings of 2015 Enhanced Safety of Vehicles Conference*; Highway Loss Data Institute Bulletins Vol. 28 No. 21 (Acura), Vol. 29 No. 5 (Volvo) & No. 7 (Mercedes-Benz), Vol. 31 no. 2 (Honda), Vol. 32 Nos. 7, 8, 22, 33 (Honda, Subaru, Mazda, Honda respectively) available at www.iihs.org; **Effectiveness of forward collision warning systems with and without autonomous emergency braking in reducing police-reported crash rates**; Cicchino, J.B., January 2016 available at www.iihs.org; **Effectiveness of Volvo’s City Safety low-speed autonomous emergency braking system in reducing police-reported crash rates**; Cicchino, J.B., January 2016 available at www.iihs.org.



implementation of the basic performance requirements contained in this document will reduce overall crashes in the relevant crash scenarios.

The AEB systems for which benefits have been documented do have limitations. Many current AEB systems activate only in front-to-rear crash scenarios. They also may have other technological limitations, such as a narrow range of operating speeds or sensors that are adversely affected by weather conditions, dirt or harsh lighting conditions. Additionally, despite extensive testing by automakers, it is possible that customers could experience unique situations resulting in unwarranted interventions by the systems. These occurrences are expected to be infrequent and have a minimal influence on the greater benefits of these systems.

Nissan North America, Inc. (Nissan) **independently** and **voluntarily** commits to make AEB systems a standard feature on substantially all new vehicles (as set forth in this document) by the realization date(s) listed below. Nothing in this document prevents Nissan from (a) introducing AEB with a higher functionality than that set forth in this document; (b) making AEB standard on all vehicles earlier than the commitment in this document; or (c) using any technology we independently choose to satisfy the AEB performance standards. Moreover, nothing in this document is intended to prevent Nissan from developing new or different braking technologies in the future. Finally, nothing in this commitment prevents or is intended to prevent: (a) NHTSA or IIHS from pursuing other initiatives to advance the performance of AEB systems or (b) Nissan meeting its statutory or regulatory obligations under Federal law.

1. DEFINITION OF AEB FUNCTIONALITY

AEB functionality for the purposes of this commitment, along with the associated test procedures, are set forth in this section. We note that AEB technology is evolving, and this commitment will not stand in the way of the development of systems with greater functionality. As such, the level of functionality and test protocols described herein are intended to identify the minimum level of functionality needed to meet the conditions of this commitment, and nothing will prevent Nissan from offering more advanced technologies.

An AEB system satisfying the terms of this commitment shall have two features, FCW and CIB.



A. Forward Collision Warning

AEB systems conforming to this commitment will include an FCW system that, when tested according to the procedures described in NHTSA's **Forward Collision Warning System Confirmation Test, February 2013**² (the "NHTSA FCW Test"), meets the **Alert Criteria** for tests 2 and 3. Specifically, as set forth in Section 12.3 of the NHTSA FCW Test, "**Test 2 – Subject Vehicle Encounters Decelerating Principal Other Vehicle**" specifies that the FCW alert shall be issued when the time-to-collision (TTC) is at least 2.4 seconds under the conditions set forth in that test. As set forth in Section 12.4 of the NHTSA FCW Test, "**Test 3 – Subject Vehicle Encounters Slower Principal Other Vehicle**" specifies that the FCW alert shall be issued when the time-to-collision (TTC) is at least 2.0 seconds under the conditions set forth in that test.³

B. Crash Imminent Braking

AEB systems conforming to this commitment will also include a CIB system that, when tested according to the procedures described in IIHS's **Autonomous Emergency Braking Test Protocol (Version I), October 2013**⁴, produce speed reductions according to option A or B:

Option A – Average speed reduction across 5 repeated tests that is greater than 10 miles per hour (mph) in either the 12 or 24 mph tests involving a stationary lead vehicle

OR

Option B – Average speed reduction across 5 repeated tests that is greater than 5 mph in both the 12 and 24 mph tests involving a stationary lead vehicle.

2. APPLICABILITY

Nissan independently and voluntarily commits to make AEB technology conforming to Sections 1.A and 1.B of this document standard equipment in substantially all light-duty vehicles and trucks (i.e., those

² Available at www.safercar.gov/staticfiles/safercar/NCAP/FCW_NCAP_Test_Procedure_2-7-2013.pdf

³ The requirements described in section 12.2 of the NHTSA FCW Test, "**Test 1 – Subject Vehicle Encounters Stopped Principal Other Vehicle**," are not included as part of this MOU.

⁴ Available at http://www.iihs.org/media/a582abfb-7691-4805-81aa-16bbdf622992/-2036166062/Ratings/Protocols/current/test_protocol_aeb.pdf



with a gross vehicle weight rating (GVWR) of 10,000 pounds or less) sold in the United States no later than the realization year set forth below. For the purposes of this commitment “substantially all” light-duty vehicles and trucks means 95 percent of vehicles intended for sale in the United States and manufactured⁵ beginning on September 1 of the realization year through August 31 of the following year. In addition, we may elect to exempt from being counted for the purposes of conformance with this commitment (a) vehicles manufactured for use as police or other emergency services vehicles, and/or (b) vehicles with re-design or end-of-life cycles occurring within 12 months of the realization date, so long as the redesigned vehicle is equipped with conforming standard AEB or the original vehicle is not replaced.

3. TIME FRAME FOR REALIZATION OF STANDARD AEB

Nissan, who independently and voluntarily commits to make AEB technology, as described in this document, a standard feature on substantially all light duty vehicles and trucks in the following realization years:

- A. For light duty vehicles and trucks 8,500 lbs. GVWR or less: no later than 2022 (i.e., manufactured beginning on September 1, 2022, through August 31, 2023); and
- B. For light duty vehicles and trucks between 8,501 and 10,000 lbs. GVWR: no later than 2025 (i.e., manufactured beginning on September 1, 2025, through August 31, 2026).

Additionally, we may, at our option, initially exempt vehicles with manual transmissions from being counted towards the 2022 realization date, and instead voluntarily make AEB standard equipment on substantially all such vehicles no later than 2024 (i.e., manufactured beginning on September 1, 2024, through August 31, 2025).

4. MONITORING PROGRESS TOWARD STANDARD AEB

NHTSA has kept the public informed about this activity through the public docket (No. NHTSA-2015-0101). Beginning in 2017, Nissan will voluntarily submit to the public docket by October 31 of each year an annual report setting forth the proportion of vehicles manufactured for sale in the United States beginning on September 1 of the previous year through August 31 of the current year that conform to

⁵ Vehicles badged/branded as Nissan or Infiniti products, regardless of which other company may have manufactured them.



the specifications of this document. Once we have demonstrated conformance with this commitment, we will no longer submit such reports to the public docket, and expect to be deemed as having fulfilled our obligations under this commitment. To increase consumer awareness, IIHS and NHTSA agree to occasionally publish progress reports, including lists of the year\make\models of vehicles with standard AEB as defined in these principles. Likewise, Nissan will make efforts to inform its customers about the availability of standard AEB in their product lines.



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A Commitment to Advancing Automatic Emergency Braking Technology

INTRODUCTION

New and advanced driver assistance systems that are intended to help drivers avoid crashes are quickly entering the motor vehicle marketplace in the United States. These systems utilize outward-looking sensors to gather information about a wide range of possible hazards associated with crashes and employ various interventions — warning, automated braking, automated steering, etc. — to assist drivers. Many crash avoidance systems are typically offered to consumers as optional content on new vehicles.

One category of crash avoidance system is known as Automatic Emergency Braking (AEB). AEB consists of a Forward Collision Warning (FCW) function designed to detect vehicles or objects ahead and alert a driver of an impending collision, coupled with Crash Imminent Braking (CIB), which provides automatic braking when forward-looking sensors indicate a crash is imminent and the driver is not reacting.

Since 2011, a growing body of research suggests that AEB systems have been beneficial in preventing or mitigating some crashes and resulting injuries and property damage. Various studies have found specific crash reductions associated with various implementations of AEB technology on a variety of vehicle types.¹ In light of such studies, on September 11, 2015, the National Highway Traffic Safety Administration (NHTSA) and the Insurance Institute for Highway Safety (IIHS) called upon automakers to convene a working group to discuss how to best advance these technologies in the near term. This document is the product of such discussions and, although the specific reductions may vary from the results found in the studies footnoted here, there is a general expectation that the fleet wide implementation of the basic performance requirements contained in this document will reduce overall crashes in the relevant crash scenarios.

¹ See Highway Loss Data Institute Bulletin Vol. 28 No. 6 **Volvo City Safety loss experience — initial results** available at www.iihs.org; Highway Loss Data Institute Bulletin Vol. 32 No. 1 **Volvo City Safety loss experience – a long term update** available at www.iihs.org; Highway Loss Data Institute Bulletin Vol. 32 No. 13 **Volvo City Safety loss experience by vehicle ages** available at www.iihs.org; **Effectiveness of low speed autonomous emergency braking in real-world rear-end crashes**; Fildes, B. et al. *Accident Analysis and Prevention*, August 2015; **Real world performance of City Safety based on Swedish insurance data**; Isaksson-Hellman, I. and Lindman, M. & **AEB real world validation using UK motor insurance claims data**; Doyle, M. et al. in *Proceedings of 2015 Enhanced Safety of Vehicles Conference*; Highway Loss Data Institute Bulletins Vol. 28 No. 21 (Acura), Vol. 29 No. 5 (Volvo) & No. 7 (Mercedes-Benz), Vol. 31 no. 2 (Honda), Vol. 32 Nos. 7, 8, 22, 33 (Honda, Subaru, Mazda, Honda respectively) available at www.iihs.org; **Effectiveness of forward collision warning systems with and without autonomous emergency braking in reducing police-reported crash rates**; Cicchino, J.B., January 2016 available at www.iihs.org; **Effectiveness of Volvo's City Safety low-speed autonomous emergency braking system in reducing police-reported crash rates**; Cicchino, J.B., January 2016 available at www.iihs.org.



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The AEB systems for which benefits have been documented do have limitations. Many current AEB systems activate only in front-to-rear crash scenarios. They also may have other technological limitations, such as a narrow range of operating speeds or sensors that are adversely affected by weather conditions, dirt or harsh lighting conditions. Additionally, despite extensive testing by automakers, it is possible that customers could experience unique situations resulting in unwarranted interventions by the systems. These occurrences are expected to be infrequent and have a minimal influence on the greater benefits of these systems.

Porsche **independently** and **voluntarily** commits to make AEB systems a standard feature on substantially all new vehicles (as set forth in this document) by the realization date(s) listed below. Nothing in this document prevents Porsche from (a) introducing AEB with a higher functionality than that set forth in this document; (b) making AEB standard on all vehicles earlier than the commitment in this document; or (c) using any technology we independently choose to satisfy the AEB performance standards. Moreover, nothing in this document is intended to prevent Porsche from developing new or different braking technologies in the future. Finally, nothing in this commitment prevents or is intended to prevent: (a) NHTSA or IIHS from pursuing other initiatives to advance the performance of AEB systems or (b) Porsche meeting its statutory or regulatory obligations under Federal law.

1. DEFINITION OF AEB FUNCTIONALITY

AEB functionality for the purposes of this commitment, along with the associated test procedures, are set forth in this section. We note that AEB technology is evolving, and this commitment will not stand in the way of the development of systems with greater functionality. As such, the level of functionality and test protocols described herein are intended to identify the minimum level of functionality needed to meet the conditions of this commitment, and nothing will prevent Porsche from offering more advanced technologies.

An AEB system satisfying the terms of this commitment shall have two features, FCW and CIB.

A. Forward Collision Warning

AEB systems conforming to this commitment will include an FCW system that, when tested according to the procedures described in NHTSA's **Forward Collision Warning System Confirmation Test, February**



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2013² (the "NHTSA FCW Test"), meets the **Alert Criteria** for tests 2 and 3. Specifically, as set forth in Section 12.3 of the NHTSA FCW Test, "**Test 2 – Subject Vehicle Encounters Decelerating Principal Other Vehicle**" specifies that the FCW alert shall be issued when the time-to-collision (TTC) is at least 2.4 seconds under the conditions set forth in that test. As set forth in Section 12.4 of the NHTSA FCW Test, "**Test 3 – Subject Vehicle Encounters Slower Principal Other Vehicle**" specifies that the FCW alert shall be issued when the time-to-collision (TTC) is at least 2.0 seconds under the conditions set forth in that test.³

B. Crash Imminent Braking

AEB systems conforming to this commitment will also include a CIB system that, when tested according to the procedures described in IIHS's **Autonomous Emergency Braking Test Protocol (Version I), October 2013⁴**, produce speed reductions according to option A or B:

Option A – Average speed reduction across 5 repeated tests that is greater than 10 miles per hour (mph) in either the 12 or 24 mph tests involving a stationary lead vehicle

OR

Option B – Average speed reduction across 5 repeated tests that is greater than 5 mph in both the 12 and 24 mph tests involving a stationary lead vehicle.

2. APPLICABILITY

Porsche independently and voluntarily commits to make AEB technology conforming to Sections 1.A and 1.B of this document standard equipment in substantially all light-duty vehicles and trucks (i.e., those with a gross vehicle weight rating (GVWR) of 10,000 pounds or less) sold in the United States no later than the realization year set forth below. For the purposes of this commitment "substantially all" light-duty vehicles and trucks

² Available at www.safercar.gov/staticfiles/safercar/NCAP/FCW_NCAP_Test_Procedure_2-7-2013.pdf

³ The requirements described in section 12.2 of the NHTSA FCW Test, "**Test 1 – Subject Vehicle Encounters Stopped Principal Other Vehicle,**" are not included as part of this MOU.

⁴ Available at http://www.iihs.org/media/a582abfb-7691-4805-81aa-16bbdf622992/-2036166062/Ratings/Protocols/current/test_protocol_aeb.pdf



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means 95 percent of vehicles intended for sale in the United States and manufactured⁵ beginning on September 1 of the realization year through August 31 of the following year. In addition, we may elect to exempt from being counted for the purposes of conformance with this commitment (a) vehicles manufactured for use as police or other emergency services vehicles, and/or (b) vehicles with re-design or end-of-life cycles occurring within 12 months of the realization date, so long as the redesigned vehicle is equipped with conforming standard AEB or the original vehicle is not replaced.

3. TIME FRAME FOR REALIZATION OF STANDARD AEB

Porsche, who independently and voluntarily commits to make AEB technology, as described in this document, a standard feature on substantially all light duty vehicles and trucks in the following realization years:

- A. For light duty vehicles and trucks 8,500 lbs. GVWR or less: no later than 2022 (i.e., manufactured beginning on September 1, 2022, through August 31, 2023); and
- B. For light duty vehicles and trucks between 8,501 and 10,000 lbs. GVWR: no later than 2025 (i.e., manufactured beginning on September 1, 2025, through August 31, 2026).

Additionally, we may, at our option, initially exempt vehicles with manual transmissions from being counted towards the 2022 realization date, and instead voluntarily make AEB standard equipment on substantially all such vehicles no later than 2024 (i.e., manufactured beginning on September 1, 2024, through August 31, 2025).

4. MONITORING PROGRESS TOWARD STANDARD AEB

NHTSA has kept the public informed about this activity through the public docket (No. NHTSA-2015-0101). Beginning in 2017, Porsche will voluntarily submit to the public docket by October 31 of each year an annual report setting forth the proportion of vehicles manufactured for sale in the United States beginning on September 1 of the previous year through August 31 of the current year that conform to the specifications of this document. Once we have demonstrated conformance with this commitment, we will no longer submit such reports to the public docket, and expect to be deemed as having fulfilled our obligations under this commitment. To increase consumer awareness, IHS and NHTSA agree to occasionally publish progress reports, including lists of the year\make\models of vehicles with standard AEB as defined in these principles.

⁵ Vehicles badged/branded as (*Name of automaker*) products, regardless of which other company may have manufactured them.



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Likewise, Porsche will make efforts to inform its customers about the availability of standard AEB in their product lines.



A Commitment to Advancing Automatic Emergency Braking Technology

INTRODUCTION

New and advanced driver assistance systems that are intended to help drivers avoid crashes are quickly entering the motor vehicle marketplace in the United States. These systems utilize outward-looking sensors to gather information about a wide range of possible hazards associated with crashes and employ various interventions — warning, automated braking, automated steering, etc. — to assist drivers. Many crash avoidance systems are typically offered to consumers as optional content on new vehicles.

One category of crash avoidance system is known as Automatic Emergency Braking (AEB). AEB consists of a Forward Collision Warning (FCW) function designed to detect vehicles or objects ahead and alert a driver of an impending collision, coupled with Crash Imminent Braking (CIB), which provides automatic braking when forward-looking sensors indicate a crash is imminent and the driver is not reacting.

Since 2011, a growing body of research suggests that AEB systems have been beneficial in preventing or mitigating some crashes and resulting injuries and property damage. Various studies have found specific crash reductions associated with various implementations of AEB technology on a variety of vehicle types.¹ In light of such studies, on September 11, 2015, the National Highway Traffic Safety Administration (NHTSA) and the Insurance Institute for Highway Safety (IIHS) called upon automakers to convene a working group to discuss how to best advance these technologies in the near term. This document is the product of such discussions and, although the specific reductions may vary from the results found in the studies footnoted here, there is a general expectation that the fleet wide

¹ See Highway Loss Data Institute Bulletin Vol. 28 No. 6 **Volvo City Safety loss experience — initial results** available at www.iihs.org; Highway Loss Data Institute Bulletin Vol. 32 No. 1 **Volvo City Safety loss experience — a long term update** available at www.iihs.org; Highway Loss Data Institute Bulletin Vol. 32 No. 13 **Volvo City Safety loss experience by vehicle ages** available at www.iihs.org; **Effectiveness of low speed autonomous emergency braking in real-world rear-end crashes**; Fildes, B. et al. *Accident Analysis and Prevention*, August 2015; **Real world performance of City Safety based on Swedish insurance data**; Isaksson-Hellman, I. and Lindman, M. & **AEB real world validation using UK motor insurance claims data**; Doyle, M. et al. in *Proceedings of 2015 Enhanced Safety of Vehicles Conference*; Highway Loss Data Institute Bulletins Vol. 28 No. 21 (Acura), Vol. 29 No. 5 (Volvo) & No. 7 (Mercedes-Benz), Vol. 31 no. 2 (Honda), Vol. 32 Nos. 7, 8, 22, 33 (Honda, Subaru, Mazda, Honda respectively) available at www.iihs.org; **Effectiveness of forward collision warning systems with and without autonomous emergency braking in reducing police-reported crash rates**; Cicchino, J.B., January 2016 available at www.iihs.org; **Effectiveness of Volvo's City Safety low-speed autonomous emergency braking system in reducing police-reported crash rates**; Cicchino, J.B., January 2016 available at www.iihs.org.



implementation of the basic performance requirements contained in this document will reduce overall crashes in the relevant crash scenarios.

The AEB systems for which benefits have been documented do have limitations. Many current AEB systems activate only in front-to-rear crash scenarios. They also may have other technological limitations, such as a narrow range of operating speeds or sensors that are adversely affected by weather conditions, dirt or harsh lighting conditions. Additionally, despite extensive testing by automakers, it is possible that customers could experience unique situations resulting in unwarranted interventions by the systems. These occurrences are expected to be infrequent and have a minimal influence on the greater benefits of these systems.

Subaru **independently** and **voluntarily** commits to make AEB systems a standard feature on substantially all new vehicles (as set forth in this document) by the realization date(s) listed below. Nothing in this document prevents Subaru from (a) introducing AEB with a higher functionality than that set forth in this document; (b) making AEB standard on all vehicles earlier than the commitment in this document; or (c) using any technology we independently choose to satisfy the AEB performance standards. Moreover, nothing in this document is intended to prevent Subaru from developing new or different braking technologies in the future. Finally, nothing in this commitment prevents NHTSA or IIHS from pursuing other initiatives to advance the performance of AEB systems or from Subaru meeting its statutory responsibility under Federal law.

1. DEFINITION OF AEB FUNCTIONALITY

AEB functionality for the purposes of this commitment, along with the associated test procedures, are set forth in this section. We note that AEB technology is evolving, and this commitment will not stand in the way of the development of systems with greater functionality. As such, the level of functionality and test protocols described herein are intended to identify the minimum level of functionality needed to meet the conditions of this commitment, and nothing will prevent Subaru from offering more advanced technologies.

An AEB system satisfying the terms of this commitment shall have two features, FCW and CIB.

A. Forward Collision Warning



AEB systems conforming to this commitment will include an FCW system that, when tested according to the procedures described in NHTSA's **Forward Collision Warning System Confirmation Test, February 2013**² (the "NHTSA FCW Test"), meets the **Alert Criteria** for tests 2 and 3. Specifically, as set forth in Section 12.3 of the NHTSA FCW Test, "**Test 2 – Subject Vehicle Encounters Decelerating Principal Other Vehicle**" specifies that the FCW alert shall be issued when the time-to-collision (TTC) is at least 2.4 seconds under the conditions set forth in that test. As set forth in Section 12.4 of the NHTSA FCW Test, "**Test 3 – Subject Vehicle Encounters Slower Principal Other Vehicle**" specifies that the FCW alert shall be issued when the time-to-collision (TTC) is at least 2.0 seconds under the conditions set forth in that test.³

B. Crash Imminent Braking

AEB systems conforming to this commitment will also include a CIB system that, when tested according to the procedures described in IIHS's **Autonomous Emergency Braking Test Protocol (Version I), October 2013**⁴, produce speed reductions according to option A or B:

Option A – Average speed reduction across 5 repeated tests that is greater than 10 miles per hour (mph) in either the 12 or 24 mph tests involving a stationary lead vehicle

OR

Option B – Average speed reduction across 5 repeated tests that is greater than 5 mph in both the 12 and 24 mph tests involving a stationary lead vehicle.

2. APPLICABILITY

Subaru independently and voluntarily commits to make AEB technology conforming to Sections 1.A and 1.B of this document standard equipment in substantially all light-duty vehicles and trucks (i.e., those with a gross vehicle weight rating (GVWR) of 10,000 pounds or less) sold in the United States no later than the realization year set forth below. For the purposes of this commitment "substantially all" light-duty vehicles and trucks means 95 percent of vehicles intended for sale in the United States and

² Available at www.safercar.gov/staticfiles/safercar/NCAP/FCW_NCAP_Test_Procedure_2-7-2013.pdf

³ The requirements described in section 12.2 of the NHTSA FCW Test, "**Test 1 – Subject Vehicle Encounters Stopped Principal Other Vehicle,**" are not included as part of this MOU.

⁴ Available at http://www.iihs.org/media/a582abfb-7691-4805-81aa-16bbdf622992/-2036166062/Ratings/Protocols/current/test_protocol_aeb.pdf



manufactured⁵ beginning on September 1 of the realization year through August 31 of the following year. In addition, we may elect to exempt from being counted for the purposes of conformance with this commitment (a) vehicles manufactured for use as police or other emergency services vehicles, and/or (b) vehicles with re-design or end-of-life cycles occurring within 12 months of the realization date, so long as the redesigned vehicle is equipped with conforming standard AEB or the original vehicle is not replaced.

3. TIME FRAME FOR REALIZATION OF STANDARD AEB

Subaru, which independently and voluntarily commits to make AEB technology, as described in this document, a standard feature on substantially all light duty vehicles and trucks in the following realization years:

- A. For light duty vehicles and trucks 8,500 lbs. GVWR or less: no later than 2022 (i.e., manufactured beginning on September 1, 2022, through August 31, 2023); and
- B. For light duty vehicles and trucks between 8,501 and 10,000 lbs. GVWR: no later than 2025 (i.e., manufactured beginning on September 1, 2025, through August 31, 2026).

Additionally, we may, at our option, initially exempt vehicles with manual transmissions from being counted towards the 2022 realization date, and instead voluntarily make AEB standard equipment on substantially all such vehicles no later than 2024 (i.e., manufactured beginning on September 1, 2024, through August 31, 2025).

4. MONITORING PROGRESS TOWARD STANDARD AEB

NHTSA has kept the public informed about this activity through the public docket (No. NHTSA-2015-0101). Beginning in 2017, Subaru will voluntarily submit to the public docket by October 31 of each year an annual report setting forth the proportion of vehicles manufactured for sale in the United States beginning on September 1 of the previous year through August 31 of the current year that conform to the specifications of this document. Once we have demonstrated conformance with this commitment, we will no longer submit such reports to the public docket, and expect to be deemed as having fulfilled our obligations under this commitment. To increase consumer awareness, IIHS and NHTSA agree to occasionally publish progress reports, including lists of the year\make\models of vehicles with standard

⁵ A vehicle's manufacturer shall be defined based on the badging/brand of the vehicle, regardless of which company may have manufactured the vehicle.



AEB as defined in these principles. Likewise, Subaru will make efforts to inform its customers about the availability of standard AEB in their product lines.

The undersigned, Shinichiro Sumi, is President of Fuji Heavy Industries USA, Inc. and is authorized by Fuji Heavy Industries Ltd. to execute the foregoing Commitment on its behalf and on behalf of Subaru of America, Inc.

A handwritten signature in cursive script that reads "S Sumi".

Shinichiro Sumi

Date: 2/26/2016



March 4, 2016

Nathaniel M. Beuse
Associate Administrator, Vehicle Safety Research
National Highway Traffic Safety Administration
1200 New Jersey Avenue, S.E.
Washington, D.C. 20590

David Zuby
Executive Vice President & Chief Research Officer
Insurance Institute for Highway Safety
988 Dairy Road
Ruckersville, VA 22968

Messrs. Beuse and Zuby,

Tesla Motors Inc. ("Tesla" or the "Company") understands that the attached letter represents the industry-drafted commitment to making Automatic Emergency Braking (AEB) standard on substantially all vehicles by Model Year ("MY") 2022, with some caveats. The Company believes that facilitating the widespread adoption of advanced driver assistance systems such as AEB is imperative to preventing injuries and property damage. As such, Tesla has made AEB technology standard on all its vehicles, either as original equipment or via an over-the-air ("OTA") update, since approximately October 2014. The Company commits to continuing to do so, including meeting the agreed-upon technological standards for those systems within the attached document by MY 2022.

Tesla looks forward to continuing to work with the National Highway Traffic Safety Administration and Insurance Institute for Highway Safety to promote safety. Should you have any questions, please do not hesitate to contact me at (202) 549-9819.

Kind regards,

A handwritten signature in black ink, appearing to read "James C. Chen". The signature is fluid and cursive, with a long horizontal line extending to the right.

James C. Chen, Vice President of Regulatory Affairs and
Deputy General Counsel

Enc.

A Commitment to Advancing Automatic Emergency Braking Technology

INTRODUCTION

New and advanced driver assistance systems that are intended to help drivers avoid crashes are quickly entering the motor vehicle marketplace in the United States. These systems utilize outward-looking sensors to gather information about a wide range of possible hazards associated with crashes and employ various interventions — warning, automated braking, automated steering, etc. — to assist drivers. Many crash avoidance systems are typically offered to consumers as optional content on new vehicles.

One category of crash avoidance system is known as Automatic Emergency Braking (AEB). AEB consists of a Forward Collision Warning (FCW) function designed to detect vehicles or objects ahead and alert a driver of an impending collision, coupled with Crash Imminent Braking (CIB), which provides automatic braking when forward-looking sensors indicate a crash is imminent and the driver is not reacting.

Since 2011, a growing body of research suggests that AEB systems have been beneficial in preventing or mitigating some crashes and resulting injuries and property damage. Various studies have found specific crash reductions associated with various implementations of AEB technology on a variety of vehicle types.¹ In light of such studies, on September 11, 2015, the National Highway Traffic Safety Administration (NHTSA) and the Insurance Institute for Highway Safety (IIHS) called upon automakers to convene a working group to discuss how to best advance these technologies in the near term. This document is the product of such discussions and, although the specific reductions may vary from the results found in the studies footnoted here, there is a general expectation that the fleet wide implementation of the basic performance requirements contained in this document will reduce overall crashes in the relevant crash scenarios.

¹ See Highway Loss Data Institute Bulletin Vol. 28 No. 6 **Volvo City Safety loss experience — initial results** available at www.iihs.org; Highway Loss Data Institute Bulletin Vol. 32 No. 1 **Volvo City Safety loss experience – a long term update** available at www.iihs.org; Highway Loss Data Institute Bulletin Vol. 32 No. 13 **Volvo City Safety loss experience by vehicle ages** available at www.iihs.org; **Effectiveness of low speed autonomous emergency braking in real-world rear-end crashes**; Fildes, B. et al. *Accident Analysis and Prevention*, August 2015; **Real world performance of City Safety based on Swedish insurance data**; Isaksson-Hellman, I. and Lindman, M. & **AEB real world validation using UK motor insurance claims data**; Doyle, M. et al. in *Proceedings of 2015 Enhanced Safety of Vehicles Conference*; Highway Loss Data Institute Bulletins Vol. 28 No. 21 (Acura), Vol. 29 No. 5 (Volvo) & No. 7 (Mercedes-Benz), Vol. 31 no. 2 (Honda), Vol. 32 Nos. 7, 8, 22, 33 (Honda, Subaru, Mazda, Honda respectively) available at www.iihs.org; **Effectiveness of forward collision warning systems with and without autonomous emergency braking in reducing police-reported crash rates**; Cicchino, J.B., January 2016 available at www.iihs.org; **Effectiveness of Volvo’s City Safety low-speed autonomous emergency braking system in reducing police-reported crash rates**; Cicchino, J.B., January 2016 available at www.iihs.org.

The AEB systems for which benefits have been documented do have limitations. Many current AEB systems activate only in front-to-rear crash scenarios. They also may have other technological limitations, such as a narrow range of operating speeds or sensors that are adversely affected by weather conditions, dirt or harsh lighting conditions. Additionally, despite extensive testing by automakers, it is possible that customers could experience unique situations resulting in unwarranted interventions by the systems. These occurrences are expected to be infrequent and have a minimal influence on the greater benefits of these systems.

Manufacturers signing onto this letter independently and voluntarily commit to make AEB systems a standard feature on substantially all new vehicles (as set forth in this document) by the realization date(s) listed below. Nothing in this document prevents participating manufacturers from (a) introducing AEB with a higher functionality than that set forth in this document; (b) making AEB standard on all vehicles earlier than the commitment in this document; or (c) using any technology the manufacturer independently chooses to satisfy the AEB performance standards. Moreover, nothing in this document is intended to prevent the participating manufacturer from developing new or different braking technologies in the future. Finally, nothing in this commitment prevents or is intended to prevent: (a) NHTSA or IIHS from pursuing other initiatives to advance the performance of AEB systems or (b) the participating manufacturer meeting its statutory or regulatory obligations under Federal law.

1. DEFINITION OF AEB FUNCTIONALITY

AEB functionality for the purposes of this commitment, along with the associated test procedures, is set forth in this section. Participating manufacturers note that AEB technology is evolving, and this commitment will not stand in the way of the development of systems with greater functionality. As such, the level of functionality and test protocols described herein are intended to identify the minimum level of functionality needed to meet the conditions of this commitment, and nothing will prevent participating manufacturers from offering more advanced technologies.

An AEB system satisfying the terms of this commitment shall have two features, FCW and CIB.

A. Forward Collision Warning

AEB systems conforming to this commitment will include an FCW system that, when tested according to the procedures described in NHTSA's **Forward Collision Warning System Confirmation Test, February**

2013² (the “NHTSA FCW Test”), meets the **Alert Criteria** for tests 2 and 3. Specifically, as set forth in Section 12.3 of the NHTSA FCW Test, “**Test 2 – Subject Vehicle Encounters Decelerating Principal Other Vehicle**” specifies that the FCW alert shall be issued when the time-to-collision (TTC) is at least 2.4 seconds under the conditions set forth in that test. As set forth in Section 12.4 of the NHTSA FCW Test, “**Test 3 – Subject Vehicle Encounters Slower Principal Other Vehicle**” specifies that the FCW alert shall be issued when the time-to-collision (TTC) is at least 2.0 seconds under the conditions set forth in that test.³

B. Crash Imminent Braking

AEB systems conforming to this commitment will also include a CIB system that, when tested according to the procedures described in IIHS’s **Autonomous Emergency Braking Test Protocol (Version I), October 2013⁴**, produce speed reductions according to option A or B:

Option A – Average speed reduction across 5 repeated tests that is greater than 10 miles per hour (mph) in either the 12 or 24 mph tests involving a stationary lead vehicle

OR

Option B – Average speed reduction across 5 repeated tests that is greater than 5 mph in both the 12 and 24 mph tests involving a stationary lead vehicle.

2. APPLICABILITY

Participating manufacturers independently and voluntarily commit to make AEB technology conforming to Sections 1.A and 1.B of this document standard equipment in substantially all light-duty vehicles and trucks (i.e., those with a gross vehicle weight rating (GVWR) of 10,000 pounds or less) produced for sale in the United States no later than the realization year set forth below. For the purposes of this commitment “substantially all” light-duty vehicles and trucks means 95 percent of vehicles intended for sale in the United States and manufactured⁵ beginning on September 1 of the realization year through August 31 of the following year. In addition, participating manufacturers may elect to exempt from

² Available at www.safercar.gov/staticfiles/safercar/NCAP/FCW_NCAP_Test_Procedure_2-7-2013.pdf

³ The requirements described in section 12.2 of the NHTSA FCW Test, “**Test 1 – Subject Vehicle Encounters Stopped Principal Other Vehicle,**” are not included as part of this MOU.

⁴ Available at http://www.iihs.org/media/a582abfb-7691-4805-81aa-16bbdf622992/-2036166062/Ratings/Protocols/current/test_protocol_aeb.pdf

⁵ Vehicles badged/branded as the participating manufacturer’s products, regardless of which other company may have manufactured them.

being counted for the purposes of conformance with this commitment (a) vehicles manufactured for use as police or other emergency services vehicles, and/or (b) vehicles with re-design or end-of-life cycles occurring within 12 months of the realization date, so long as the redesigned vehicle is equipped with conforming standard AEB or the original vehicle is not replaced.

3. TIME FRAME FOR REALIZATION OF STANDARD AEB

The participating manufacturers, who independently and voluntarily commit to make AEB technology, as described in this document, a standard feature on substantially all light duty vehicles and trucks in the following realization years:

- A. For light duty vehicles and trucks 8,500 lbs. GVWR or less: no later than 2022 (i.e., manufactured beginning on September 1, 2022, through August 31, 2023); and
- B. For light duty vehicles and trucks between 8,501 and 10,000 lbs. GVWR: no later than 2025 (i.e., manufactured beginning on September 1, 2025, through August 31, 2026).

Additionally, participating manufacturers may, at their option, initially exempt vehicles with manual transmissions from being counted towards the 2022 realization date, and instead voluntarily make AEB standard equipment on substantially all such vehicles no later than 2024 (i.e., manufactured beginning on September 1, 2024, through August 31, 2025).

4. MONITORING PROGRESS TOWARD STANDARD AEB

NHTSA has kept the public informed about this activity through the public docket (No. NHTSA-2015-0101). Beginning in 2017, participating manufacturers will voluntarily submit to the public docket by October 31 of each year an annual report setting forth the proportion of vehicles manufactured for sale in the United States beginning on September 1 of the previous year through August 31 of the current year that conform to the specifications of this document. Once the participating manufacturer has demonstrated conformance with this commitment, the participating manufacturer will no longer submit such reports to the public docket, and expect to be deemed as having fulfilled its obligations under this commitment. To increase consumer awareness, IHS and NHTSA agree to occasionally publish progress reports, including lists of the year\make\models of vehicles with standard AEB as defined in these principles. Likewise, participating manufacturers will make efforts to inform their customers about the availability of standard AEB in their product lines.

TOYOTA

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A Commitment to Advancing Automatic Emergency Braking Technology

INTRODUCTION

New and advanced driver assistance systems that are intended to help drivers avoid crashes are quickly entering the motor vehicle marketplace in the United States. These systems utilize outward-looking sensors to gather information about a wide range of possible hazards associated with crashes and employ various interventions — warning, automated braking, automated steering, etc. — to assist drivers. Many crash avoidance systems are typically offered to consumers as optional content on new vehicles.

One category of crash avoidance system is known as Automatic Emergency Braking (AEB). AEB consists of a Forward Collision Warning (FCW) function designed to detect vehicles or objects ahead and alert a driver of an impending collision, coupled with Crash Imminent Braking (CIB), which provides automatic braking when forward-looking sensors indicate a crash is imminent and the driver is not reacting.

Since 2011, a growing body of research suggests that AEB systems have been beneficial in preventing or mitigating some crashes and resulting injuries and property damage. Various studies have found specific crash reductions associated with various implementations of AEB technology on a variety of vehicle types.¹ In light of such studies, on September 11, 2015, the National Highway Traffic Safety Administration (NHTSA) and the Insurance Institute for Highway Safety (IIHS) called upon automakers to convene a working group to discuss how to best advance these technologies in the near term. This document is the product of such discussions and, although the specific reductions may vary from the

¹ See Highway Loss Data Institute Bulletin Vol. 28 No. 6 *Volvo City Safety loss experience — Initial results* available at www.iihs.org; Highway Loss Data Institute Bulletin Vol. 32 No. 1 *Volvo City Safety loss experience – a long term update* available at www.iihs.org; Highway Loss Data Institute Bulletin Vol. 32 No. 13 *Volvo City Safety loss experience by vehicle ages* available at www.iihs.org; *Effectiveness of low speed autonomous emergency braking in real-world rear-end crashes*; Fildes, B. et al. *Accident Analysis and Prevention*, August 2015; *Real world performance of City Safety based on Swedish insurance data*; Isaksson-Hellman, I. and Lindman, M. & *AEB real world validation using UK motor insurance claims data*; Doyle, M. et al. in *Proceedings of 2015 Enhanced Safety of Vehicles Conference*; Highway Loss Data Institute Bulletins Vol. 28 No. 21 (Acura), Vol. 29 No. 5 (Volvo) & No. 7 (Mercedes-Benz), Vol. 31 no. 2 (Honda), Vol. 32 Nos. 7, 8, 22, 33 (Honda, Subaru, Mazda, Honda respectively) available at www.iihs.org; *Effectiveness of forward collision warning systems with and without autonomous emergency braking in reducing police-reported crash rates*; Cicchino, J.B., January 2016 available at www.iihs.org; *Effectiveness of Volvo's City Safety low-speed autonomous emergency braking system in reducing police-reported crash rates*; Cicchino, J.B., January 2016 available at www.iihs.org.

results found in the studies footnoted here, there is a general expectation that the fleet wide implementation of the basic performance requirements contained in this document will reduce overall crashes in the relevant crash scenarios.

The AEB systems for which benefits have been documented do have limitations. Many current AEB systems activate only in front-to-rear crash scenarios. They also may have other technological limitations, such as a narrow range of operating speeds or sensors that are adversely affected by weather conditions, dirt or harsh lighting conditions. Additionally, despite extensive testing by automakers, it is possible that customers could experience unique situations resulting in unwarranted interventions by the systems. These occurrences are expected to be infrequent and have a minimal influence on the greater benefits of these systems.

Toyota independently and voluntarily commits to make AEB systems a standard feature on substantially all new vehicles (as set forth in this document) by the realization date(s) listed below. Nothing in this document prevents Toyota from (a) introducing AEB with a higher functionality than that set forth in this document; (b) making AEB standard on all vehicles earlier than the commitment in this document; or (c) using any technology we independently choose to satisfy the AEB performance standards. Moreover, nothing in this document is intended to prevent Toyota from developing new or different braking technologies in the future. Finally, nothing in this commitment prevents NHTSA or IIHS from pursuing other initiatives to advance the performance of AEB systems or from Toyota meeting its statutory responsibility under Federal law.

1. DEFINITION OF AEB FUNCTIONALITY

AEB functionality for the purposes of this commitment, along with the associated test procedures, are set forth in this section. We note that AEB technology is evolving, and this commitment will not stand in the way of the development of systems with greater functionality. As such, the level of functionality and test protocols described herein are intended to identify the minimum level of functionality needed to meet the conditions of this commitment, and nothing will prevent Toyota from offering more advanced technologies.

An AEB system satisfying the terms of this commitment shall have two features, FCW and CIB.

A. Forward Collision Warning

AEB systems conforming to this commitment will include an FCW system that, when tested according to the procedures described in NHTSA's **Forward Collision Warning System Confirmation Test, February 2013**² (the "NHTSA FCW Test"), meets the **Alert Criteria** for tests 2 and 3. Specifically, as set forth in Section 12.3 of the NHTSA FCW Test, "**Test 2 – Subject Vehicle Encounters Decelerating Principal Other Vehicle**" specifies that the FCW alert shall be issued when the time-to-collision (TTC) is at least 2.4 seconds under the conditions set forth in that test. As set forth in Section 12.4 of the NHTSA FCW Test, "**Test 3 – Subject Vehicle Encounters Slower Principal Other Vehicle**" specifies that the FCW alert shall be issued when the time-to-collision (TTC) is at least 2.0 seconds under the conditions set forth in that test.³

B. Crash Imminent Braking

AEB systems conforming to this commitment will also include a CIB system that, when tested according to the procedures described in IIHS's **Autonomous Emergency Braking Test Protocol (Version I), October 2013**⁴, produce speed reductions according to option A or B:

Option A – Average speed reduction across 5 repeated tests that is greater than 10 miles per hour (mph) in either the 12 or 24 mph tests involving a stationary lead vehicle

OR

Option B – Average speed reduction across 5 repeated tests that is greater than 5 mph in both the 12 and 24 mph tests involving a stationary lead vehicle.

2. APPLICABILITY

Toyota independently and voluntarily commits to make AEB technology conforming to Sections 1.A and 1.B of this document standard equipment in substantially all light-duty vehicles and trucks (i.e., those with a gross vehicle weight rating (GVWR) of 10,000 pounds or less) sold in the United States no later than the realization year set forth below. For the purposes of this commitment "substantially all" light duty vehicles and trucks means 95 percent of vehicles intended for sale in the United States and

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³ The requirements described in section 12.2 of the NHTSA FCW Test, "**Test 1 – Subject Vehicle Encounters Stopped Principal Other Vehicle,**" are not included as part of this document.

⁴ Available at http://www.iihs.org/media/a582abfb-7691-4805-81aa-16bbdf622992/-2036166062/Ratings/Protocols/current/test_protocol_aeb.pdf

manufactured⁵ beginning on September 1 of the realization year through August 31 of the following year. In addition, we may elect to exempt from being counted for the purposes of conformance with this commitment (a) vehicles manufactured for use as police or other emergency services vehicles, and/or (b) vehicles with re-design or end-of-life cycles occurring within 12 months of the realization date, so long as the redesigned vehicle is equipped with conforming standard AEB or the original vehicle is not replaced.

3. TIME FRAME FOR REALIZATION OF STANDARD AEB

Toyota, who independently and voluntarily commits to make AEB technology, as described in this document, a standard feature on substantially all light duty vehicles and trucks in the following realization years:

- A. For light duty vehicles and trucks 8,500 lbs. GVWR or less: no later than 2022 (i.e., manufactured beginning on September 1, 2022, through August 31, 2023); and
- B. For light duty vehicles and trucks between 8,501 and 10,000 lbs. GVWR: no later than 2025 (i.e., manufactured beginning on September 1, 2025, through August 31, 2026).

Additionally, we may, at our option, initially exempt vehicles with manual transmissions from being counted towards the 2022 realization date, and instead voluntarily make AEB standard equipment on substantially all such vehicles no later than 2024 (i.e., manufactured beginning on September 1, 2024, through August 31, 2025).

4. MONITORING PROGRESS TOWARD STANDARD AEB

NHTSA has kept the public informed about this activity through the public docket (No. NHTSA-2015-0101). Beginning in 2017, Toyota will voluntarily submit to the public docket by October 31 of each year an annual report setting forth the proportion of vehicles manufactured for sale in the United States beginning on September 1 of the previous year through August 31 of the current year that conform to the specifications of this document. Once we have demonstrated conformance with this commitment, we will no longer submit such reports to the public docket, and expect to be deemed as having fulfilled our obligations under this commitment. To increase consumer awareness, IIHS and NHTSA agree to occasionally publish progress reports, including lists of the year\make\models of vehicles with standard

⁵ A vehicle's manufacturer shall be defined based on the badging/brand of the vehicle, regardless of which company may have manufactured the vehicle.

AEB as defined in these principles. Likewise, Toyota will make efforts to inform its customers about the availability of standard AEB in their product lines.



A Commitment to Advancing Automatic Emergency Braking Technology

INTRODUCTION

New and advanced driver assistance systems that are intended to help drivers avoid crashes are quickly entering the motor vehicle marketplace in the United States. These systems utilize outward-looking sensors to gather information about a wide range of possible hazards associated with crashes and employ various interventions — warning, automated braking, automated steering, etc. — to assist drivers. Many crash avoidance systems are typically offered to consumers as optional content on new vehicles.

One category of crash avoidance system is known as Automatic Emergency Braking (AEB). AEB consists of a Forward Collision Warning (FCW) function designed to detect vehicles or objects ahead and alert a driver of an impending collision, coupled with Crash Imminent Braking (CIB), which provides automatic braking when forward-looking sensors indicate a crash is imminent and the driver is not reacting.

Since 2011, a growing body of research suggests that AEB systems have been beneficial in preventing or mitigating some crashes and resulting injuries and property damage. Various studies have found specific crash reductions associated with various implementations of AEB technology on a variety of vehicle types.¹ In light of such studies, on September 11, 2015, the National Highway Traffic Safety Administration (NHTSA) and the Insurance Institute for Highway Safety (IIHS) called upon automakers to convene a working group to discuss how to best advance these technologies in the near term. This document is the product of such discussions and, although the specific reductions may vary from the results found in the studies footnoted here, there is a general expectation that the fleet wide

¹ See Highway Loss Data Institute Bulletin Vol. 28 No. 6 **Volvo City Safety loss experience — initial results** available at www.iihs.org; Highway Loss Data Institute Bulletin Vol. 32 No. 1 **Volvo City Safety loss experience – a long term update** available at www.iihs.org; Highway Loss Data Institute Bulletin Vol. 32 No. 13 **Volvo City Safety loss experience by vehicle ages** available at www.iihs.org; **Effectiveness of low speed autonomous emergency braking in real-world rear-end crashes**; Fildes, B. et al. *Accident Analysis and Prevention*, August 2015; **Real world performance of City Safety based on Swedish insurance data**; Isaksson-Hellman, I. and Lindman, M. & **AEB real world validation using UK motor insurance claims data**; Doyle, M. et al. in *Proceedings of 2015 Enhanced Safety of Vehicles Conference*; Highway Loss Data Institute Bulletins Vol. 28 No. 21 (Acura), Vol. 29 No. 5 (Volvo) & No. 7 (Mercedes-Benz), Vol. 31 no. 2 (Honda), Vol. 32 Nos. 7, 8, 22, 33 (Honda, Subaru, Mazda, Honda respectively) available at www.iihs.org; **Effectiveness of forward collision warning systems with and without autonomous emergency braking in reducing police-reported crash rates**; Cicchino, J.B., January 2016 available at www.iihs.org; **Effectiveness of Volvo's City Safety low-speed autonomous emergency braking system in reducing police-reported crash rates**; Cicchino, J.B., January 2016 available at www.iihs.org.



implementation of the basic performance requirements contained in this document will reduce overall crashes in the relevant crash scenarios.

The AEB systems for which benefits have been documented do have limitations. Many current AEB systems activate only in front-to-rear crash scenarios. They also may have other technological limitations, such as a narrow range of operating speeds or sensors that are adversely affected by weather conditions, dirt or harsh lighting conditions. Additionally, despite extensive testing by automakers, it is possible that customers could experience unique situations resulting in unwarranted interventions by the systems. These occurrences are expected to be infrequent and have a minimal influence on the greater benefits of these systems.

Volkswagen of America **independently** and **voluntarily** commits to make AEB systems a standard feature on substantially all new vehicles (as set forth in this document) by the realization date(s) listed below. Nothing in this document prevents Volkswagen of America from (a) introducing AEB with a higher functionality than that set forth in this document; (b) making AEB standard on all vehicles earlier than the commitment in this document; or (c) using any technology we independently choose to satisfy the AEB performance standards. Moreover, nothing in this document is intended to prevent Volkswagen of America from developing new or different braking technologies in the future. Finally, nothing in this commitment prevents or is intended to prevent: (a) NHTSA or IIHS from pursuing other initiatives to advance the performance of AEB systems or (b) Volkswagen of America meeting its statutory or regulatory obligations under Federal law.

1. DEFINITION OF AEB FUNCTIONALITY

AEB functionality for the purposes of this commitment, along with the associated test procedures, are set forth in this section. We note that AEB technology is evolving, and this commitment will not stand in the way of the development of systems with greater functionality. As such, the level of functionality and test protocols described herein are intended to identify the minimum level of functionality needed to meet the conditions of this commitment, and nothing will prevent Volkswagen of America from offering more advanced technologies.

An AEB system satisfying the terms of this commitment shall have two features, FCW and CIB.



A. Forward Collision Warning

AEB systems conforming to this commitment will include an FCW system that, when tested according to the procedures described in NHTSA's **Forward Collision Warning System Confirmation Test, February 2013**² (the "NHTSA FCW Test"), meets the **Alert Criteria** for tests 2 and 3. Specifically, as set forth in Section 12.3 of the NHTSA FCW Test, "**Test 2 – Subject Vehicle Encounters Decelerating Principal Other Vehicle**" specifies that the FCW alert shall be issued when the time-to-collision (TTC) is at least 2.4 seconds under the conditions set forth in that test. As set forth in Section 12.4 of the NHTSA FCW Test, "**Test 3 – Subject Vehicle Encounters Slower Principal Other Vehicle**" specifies that the FCW alert shall be issued when the time-to-collision (TTC) is at least 2.0 seconds under the conditions set forth in that test.³

B. Crash Imminent Braking

AEB systems conforming to this commitment will also include a CIB system that, when tested according to the procedures described in IIHS's **Autonomous Emergency Braking Test Protocol (Version I), October 2013**⁴, produce speed reductions according to option A or B:

Option A – Average speed reduction across 5 repeated tests that is greater than 10 miles per hour (mph) in either the 12 or 24 mph tests involving a stationary lead vehicle

OR

Option B – Average speed reduction across 5 repeated tests that is greater than 5 mph in both the 12 and 24 mph tests involving a stationary lead vehicle.

2. APPLICABILITY

Volkswagen of America independently and voluntarily commits to make AEB technology conforming to Sections 1.A and 1.B of this document standard equipment in substantially all light-duty vehicles and trucks (i.e., those with a gross vehicle weight rating (GVWR) of 10,000 pounds or less) sold in the United

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States no later than the realization year set forth below. For the purposes of this commitment “substantially all” light-duty vehicles and trucks means 95 percent of vehicles intended for sale in the United States and manufactured⁵ beginning on September 1 of the realization year through August 31 of the following year. In addition, we may elect to exempt from being counted for the purposes of conformance with this commitment (a) vehicles manufactured for use as police or other emergency services vehicles, and/or (b) vehicles with re-design or end-of-life cycles occurring within 12 months of the realization date, so long as the redesigned vehicle is equipped with conforming standard AEB or the original vehicle is not replaced.

3. TIME FRAME FOR REALIZATION OF STANDARD AEB

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Additionally, we may, at our option, initially exempt vehicles with manual transmissions from being counted towards the 2022 realization date, and instead voluntarily make AEB standard equipment on substantially all such vehicles no later than 2024 (i.e., manufactured beginning on September 1, 2024, through August 31, 2025).

4. MONITORING PROGRESS TOWARD STANDARD AEB

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⁵ Vehicles badged/branded as Volkswagen of America products, regardless of which other company may have manufactured them.



having fulfilled our obligations under this commitment. To increase consumer awareness, IIHS and NHTSA agree to occasionally publish progress reports, including lists of the year\make\models of vehicles with standard AEB as defined in these principles. Likewise, Volkswagen of America will make efforts to inform its customers about the availability of standard AEB in their product lines.

A Commitment to Advancing Automatic Emergency Braking Technology

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Volvo Cars **independently** and **voluntarily** commits to make AEB systems a standard feature on substantially all new vehicles (as set forth in this document) by the realization date(s) listed below. Nothing in this document prevents Volvo Cars from (a) introducing AEB with a higher functionality than that set forth in this document; (b) making AEB standard on all vehicles earlier than the commitment in this document; or (c) using any technology we independently choose to satisfy the AEB performance standards. Moreover, nothing in this document is intended to prevent Volvo Cars from developing new or different braking technologies in the future. Finally, nothing in this commitment prevents or is intended to prevent: (a) NHTSA or IIHS from pursuing other initiatives to advance the performance of AEB systems or (b) Volvo Cars meeting its statutory or regulatory obligations under Federal law.

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An AEB system satisfying the terms of this commitment shall have two features, FCW and CIB.

A. Forward Collision Warning

AEB systems conforming to this commitment will include an FCW system that, when tested according to the procedures described in NHTSA's **Forward Collision Warning System Confirmation Test, February**

2013² (the “NHTSA FCW Test”), meets the **Alert Criteria** for tests 2 and 3. Specifically, as set forth in Section 12.3 of the NHTSA FCW Test, “**Test 2 – Subject Vehicle Encounters Decelerating Principal Other Vehicle**” specifies that the FCW alert shall be issued when the time-to-collision (TTC) is at least 2.4 seconds under the conditions set forth in that test. As set forth in Section 12.4 of the NHTSA FCW Test, “**Test 3 – Subject Vehicle Encounters Slower Principal Other Vehicle**” specifies that the FCW alert shall be issued when the time-to-collision (TTC) is at least 2.0 seconds under the conditions set forth in that test.³

B. Crash Imminent Braking

AEB systems conforming to this commitment will also include a CIB system that, when tested according to the procedures described in IIHS’s **Autonomous Emergency Braking Test Protocol (Version I), October 2013⁴**, produce speed reductions according to option A or B:

Option A – Average speed reduction across 5 repeated tests that is greater than 10 miles per hour (mph) in either the 12 or 24 mph tests involving a stationary lead vehicle

OR

Option B – Average speed reduction across 5 repeated tests that is greater than 5 mph in both the 12 and 24 mph tests involving a stationary lead vehicle.

2. APPLICABILITY

Volvo Cars independently and voluntarily commits to make AEB technology conforming to Sections 1.A and 1.B of this document standard equipment in substantially all light-duty vehicles and trucks (i.e., those with a gross vehicle weight rating (GVWR) of 10,000 pounds or less) sold in the United States no later than the realization year set forth below. For the purposes of this commitment “substantially all” light-duty vehicles and trucks means 95 percent of vehicles intended for sale in the United States and manufactured⁵ beginning on September 1 of the realization year through August 31 of the following

² Available at www.safercar.gov/staticfiles/safercar/NCAP/FCW_NCAP_Test_Procedure_2-7-2013.pdf

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⁴ Available at http://www.iihs.org/media/a582abfb-7691-4805-81aa-16bbdf622992/-2036166062/Ratings/Protocols/current/test_protocol_aeb.pdf

⁵ Vehicles badged/branded as (*Name of automaker*) products, regardless of which other company may have manufactured them.

year. In addition, we may elect to exempt from being counted for the purposes of conformance with this commitment (a) vehicles manufactured for use as police or other emergency services vehicles, and/or (b) vehicles with re-design or end-of-life cycles occurring within 12 months of the realization date, so long as the redesigned vehicle is equipped with conforming standard AEB or the original vehicle is not replaced.

3. TIME FRAME FOR REALIZATION OF STANDARD AEB

Volvo Cars, who independently and voluntarily commits to make AEB technology, as described in this document, a standard feature on substantially all light duty vehicles and trucks in the following realization years:

- A. For light duty vehicles and trucks 8,500 lbs. GVWR or less: no later than 2022 (i.e., manufactured beginning on September 1, 2022, through August 31, 2023); and
- B. For light duty vehicles and trucks between 8,501 and 10,000 lbs. GVWR: no later than 2025 (i.e., manufactured beginning on September 1, 2025, through August 31, 2026).

Additionally, we may, at our option, initially exempt vehicles with manual transmissions from being counted towards the 2022 realization date, and instead voluntarily make AEB standard equipment on substantially all such vehicles no later than 2024 (i.e., manufactured beginning on September 1, 2024, through August 31, 2025).

4. MONITORING PROGRESS TOWARD STANDARD AEB

NHTSA has kept the public informed about this activity through the public docket (No. NHTSA-2015-0101). Beginning in 2017, Volvo Cars will voluntarily submit to the public docket by October 31 of each year an annual report setting forth the proportion of vehicles manufactured for sale in the United States beginning on September 1 of the previous year through August 31 of the current year that conform to the specifications of this document. Once we have demonstrated conformance with this commitment, we will no longer submit such reports to the public docket, and expect to be deemed as having fulfilled our obligations under this commitment. To increase consumer awareness, IIHS and NHTSA agree to occasionally publish progress reports, including lists of the year's models of vehicles with standard AEB as defined in these principles. Likewise, Volvo Cars will make efforts to inform its customers about the availability of standard AEB in their product lines.