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May 8, 2007

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***BY MESSENGER***

Jeffrey L. Quandt, Chief
Vehicle Control Division
Office of Defects Investigation
National Highway Traffic Safety Administration
400 Seventh St., S.W.
Washington, D.C. 20590

**Re: NHTSA Request for Information in Preliminary Evaluation PE07-007 (Electronic Stability Program)**

Dear Mr. Quandt:

This letter is submitted on behalf of DaimlerChrysler AG and Mercedes-Benz USA, LLC (collectively "Mercedes-Benz") to the National Highway Traffic Safety Administration ("NHTSA" or "Agency") in response to the Office of Defects Investigation's February 20, 2007 request for information relating to the Agency's investigation of the Electronic Stability Program (ESP) system in model year 2000 through 2001 Mercedes M-Class vehicles.

As discussed, responses to requests numbered 8-16 are provided with this letter, and the responses to requests numbered 1-7 were provided in a submission dated April 19, 2007. Mercedes-Benz's responses to these specific requests for information are included below following a restatement of the Agency's original requests.

***Request No. 8:*** *Describe all assessments, analyses, tests, test results, studies, surveys, simulations, investigations, inquiries and/or evaluations (collectively, "actions") that relate to, or may relate to, the alleged defect in the subject vehicles that have been conducted, are being conducted, are planned, or are being planned by, or for, Mercedes-Benz. For each such action, provide the following information:*

*a. Action title or identifier;*

*b. The actual or planned start date;*
*c. The actual or expected end date;*
*d. Brief summary of the subject and objective of the action;*
*e. Engineering group(s)/supplier(s) responsible for designing and for conducting the action; and*
*f. A brief summary of the findings and/or conclusions resulting from the action.*

**Response to Request No. 8:**

Mercedes-Benz has not, except for the analysis set forth in this response and the demonstration planned for NHTSA on May 10, 2007, conducted any assessments, analyses, tests, studies, surveys, simulations, investigations, inquiries or evaluations of the alleged defect in the subject vehicles.

***Request No. 9:*** *Describe all modification or changes made by, or on behalf of, Mercedes-Benz in the design, material composition, manufacture, quality control, supply, or installation of the subject system and subject component, from the start of production to date, which relate to, or may relate to, the alleged defect in the subject vehicles. For each such modification or change, provide the following information:*

*a. The date or approximate date on which the modification or change was incorporated into vehicle production;*
*b. A detailed description of the modification or change;*
*c. The reason(s) for the modification or change;*
*d. The part numbers (service and engineering) of the original component;*
*e. The part number (service and engineering) of the modified component;*
*f. Whether the original unmodified component was withdrawn from production and/or sale, and if so, when;*
*g. When the modified component was made available as a service component; and*
*h. Whether the modified component can be interchanged with earlier production components.*

*Also, provide the above information for any modification or change that Mercedes-Benz is aware of which may be incorporated into vehicle production within the next 120 days.*

**Response to Request No. 9:**

Mercedes-Benz made no changes in the design, material composition, manufacture, quality control, supply, or installation of the subject system or subject component, in the subject vehicles, which it believes relate to, or may relate to, the alleged defect in the subject vehicles.

Within the framework of continuing product development, a series of changes to the ESP system and the yaw rate sensor were made during production of the subject vehicles. These changes were directed primarily at:

- Adjustments to the ESP system required by changes to vehicle (e.g. conversion of CAN matrix);
- Standardization of the components and functions with other later models. Commonized-parts strategy for yaw rate sensor in MS163 (ML), MS203 (C-Class), R170 (SLK); and
- Expansion of functions (e.g. introduction of ETS+).

Documents summarizing these changes are included at Tab 1 and Tab 2. Tab 1 contains documents relating to change packages for the electronic control unit (ECU). The confidential documents included at Tab 1 include an overview of ECU changes for the MK-20 ESP system in the subject vehicles providing details on six change packages, and a table outlining the implementation dates for each change.

Tab 2 contains confidential documents relating to changes in the subject yaw rate sensor (YRS). Documents included at Tab 2 include: i) a table outlining the four different YRS part numbers used in the subject vehicles and reason of the change; and ii) four design drawings for each of the YRS part numbers referenced in the table.

The original component designs were never withdrawn from part stocks. The changes to the ESP system were phased into the current series. For technical reasons, some changes to the ESP system were scheduled in combination with other vehicle changes (e.g. conversion of the CAN matrix from KM6 to KM20 (change package ÄP2)). The changes to the yaw rate sensor component were also phased into the current series. The original and revised components were interchangeable and compatible with the original system. Updated components were made available as service parts in parallel with introduction of the components into production and were used as replacement parts as soon as existing parts stocks were depleted.

***Request No. 10:*** *State the number of subject components that Mercedes-Benz has sold that may be used in the subject vehicles by component name, part number (both service and engineering/production), model and model year of the vehicle in which it is used and month/year of sale (including the cut-off date for sales, if applicable).*

*For each component part number, provide the supplier's name, address, and appropriate point of contact (name, title, and telephone number).*

*Also identify by make, model and model year, any other vehicles of which Mercedes-Benz is aware that contain the identical component, whether installed in production or in service, and state the applicable dates of production of service usage.*

**Response to Request No. 10:**

The subject yaw rate sensor was used in model series 163, 202, 170 and 203, which were sold in the U.S. as the MY 1998-2005 M-Class, MY 1994-2000 C-Class, MY 1998-2005 SLK and MY 2001-2007 C-Class. The parts referenced below were used as replacement parts for all of these models and model year vehicles which represent a total of 1,085,510 vehicles world-wide.

As of March, 2007, a total of 11,112 replacement YRS components have been sold for the MK-20 ESP system world-wide. These replacement parts were part Nos. A003542 23 18; A163 54216 18; and A163542 23 18. The world-wide part sales volumes for each of these three parts was 10,549, 269, and 294 respectively. The spreadsheet attached at Tab 3 shows the world-wide sales quantities for each part by month of sale.

Total U.S.-only sales data for these parts (used in all four model series referenced above) is available for the last two years. The total for 2005 was 789, and the total for 2006 was 692. A projected sales total for 2007 is 501, based on sales in 2007 to date.

The parts supplier for all replacement parts was Continental-Teves. The company contact is as follows:

Phillip Headley
Continental-Teves
One Continental Drive
Auburn Hills, MI 48326
(248) 393-5990

***Request No. 11:*** *Provide a detailed description of the design and operation of the subject system in all driving modes and speeds, including all related failure mode and effect analyses. Include a detailed description of system diagnostics and a list of all related fault codes.*

**Response to Request No. 11:**

A detailed description of the design and operation of the subject system and component is provided at Tab 4. Tab 4 contains the following materials:

- Description of Systron Donner's GyroChip Quartz Inertial Technology.
- System description of the braking system on the MY 1999 M-Class (Model 163) from Service Manual.

- Failure Mode and Effect Analysis Summary for Model 163 ESP dated December 1998 [Attachment Confidential].

- Section 4.2 Yaw Rate Sensor Monitoring Functions and Fault Detection, from Continental Teves Customer Product Specification [Attachment Confidential]

- Table of ESP System Fault Codes [Attachment Confidential]

- MK-20 ESP Diagnostic Specification [Attachment Confidential]

The fault codes specific to the YRS are included in the attached list of all ESP system fault codes. The YRS-specific failure codes are listed under "EEPS_FB13" and are: Offset failure; Gradient failure; Signal failure; Plausibility failure; and Sensor failure. These failure codes are discussed in detail in the responses to the questions below.

***Request No. 12:*** *Provide the following information regarding the subject components:*

*a. Detailed descriptions of the sensor design and operation;*
*b. Descriptions and copies of all documents relating to, all durability and environmental testing; and*
*c. A cutaway sample of a yaw rate sensor encased in clear plastic, if necessary, and a magnified view diagram identifying internal parts by name and function.*

**Response to Request No. 12:**

Tab 5 contains the information requested in requests 12(a) and 12(b). Tab 5 contains:

- Description of Systron Donner's GyroChip Quartz Inertial Technology

- Continental Teves Customer Product Specification ESP Yaw Rate Sensor (5/07/99) [Attachment Confidential]

- Systron Donner Design Verification Plan and Report, 1/09/98 Test Results [Attachment Confidential]

- Systron Donner Production Validation Plan and Report, 6/23/99 Test Results [Attachment Confidential]

***Request No. 13:*** *Describe and provide copies of all documents relating to all studies or assessments conducted by or for Mercedes-Benz regarding the effects on vehicle operation/control of an inappropriate activation of the subject system.*

**Response to Request No. 13:**

Failsafe functionality was addressed, and failure mode and effects analysis were undertaken during original development of the ESP system, as set forth in the documents provided in response to Request No. 11 at Tab 5. The specific failure modes for the YRS are discussed in the responses to Request Nos. 14 and 16 below.

***Request No. 14:*** *Provide the following information regarding the subject component, which is identified as the causal component in VOQ's 10176935, 10175190 & 10174434:*

a. *Describe how a dealer technician determines that a yaw rate sensor has failed or malfunctioned (provide this answer both by procedure and for the specific repairs performed for the vehicles in referenced VOQ's);*
b. *Identify all failure modes that will produce a fault code that can be retrieved by a repair technician;*
c. *Identify all failure modes that would not produce a fault code, with an explanation of how such conditions develop and how they can be detected and repaired;*
d. *Identify all intermittent failure modes that Mercedes-Benz has confirmed or theorized for the subject component;*
e. *Describe how the subject system can recognize that a signal from the subject component is inaccurate (for example, identify all other data available to the ESP processor that can be used to verify that the subject component signal is correct/plausible);*
f. *Describe the braking authority of the subject system during an ESP event, including a description of all conditions that would trigger system activation; all signals (visible, audible or other) to the driver that an ESP event is occurring; a description of how the system applies the brakes – i.e., the braking strategy for each type of event; and the duration of system activation and braking authority; and*
g. *State the location of the subject component in the subject vehicles (e.g., beneath the center console unshielded; beneath the driver's seat covered by carpeting, etc.).*

**Response to Request No. 14:**

a) When a customer indicates that an ESP warning lamp illuminated in their vehicle, the dealer technician performs a diagnostic test on the vehicle. The diagnostic data for each control unit is queried from all the vehicle's control units with the aid of Star Diagnosis (DAS) and displayed on the DAS system for the technician. The component causing the problem is detected through stored fault codes, and then repaired on the basis of the service procedures in Workshop Information System (WIS) for the respective fault codes found. The electrical test on the YRS is conducted using the instructions contained at Tab 6. In addition, a functionality test, is also performed after the yaw rate sensor has been replaced, and is performed using the instructions included at Tab 6.

b) All failure modes with retrievable fault codes and related causes are described in the system FMEA summary and Customer Product Specification for the YRS included at Tab 4. Failure modes that will produce a fault code include: C1120-06 (Gradient Fault); C1120-20 (Electrical Sensor Fault); C1120-04 (Signal Plausibility Fault), C1120-09 (Standstill Plausibility Faults); C1120-08 (Offset Fault). These failure modes result in illumination of the ESP MIL and deactivation of the active yaw controller and are discussed in more detail in the documents at Tab 4 and in the response to Request No. 16.

These monitoring functions result in a fault entry in the EEPROM of the ESP control unit. The EEPROM of the control unit is a recording medium in which fault entries are stored until read-out and deleted by the workshop. The information remains stored after the fault occurrence and remains stored in the event of a power failure in the control unit.

c) Theoretically, faults of a temporary nature, below the detection limits of the yaw rate sensor monitoring, could occur which are not recognized by the ESP system and thus would not be stored. This theoretically possibility exists in any electronic diagnostic system and any ESP system. The MK-20 ESP monitoring cycles are set to detect all known faults which are relevant to the system performance in a prompt manner. Events which would not be detected are theoretically possible, but are extremely unlikely. This potential was addressed and resolved in the development and FMEA process which found that such events with potential for a negative impact on vehicle control had an extremely low likelihood of occurrence. To date, no vehicles demonstrating such faults in the yaw rate sensor are known to Mercedes-Benz.

As discussed below, all of the vehicles referenced in the complaints made to NHTSA had fault codes stored, and are *not* examples of such theoretically fault occurrences. Because the likelihood of occurrence of such cases was confirmed in the FMEA process to be extremely improbable, service instructions and repair procedures for such hypothetical issues have not been generated for this.

d) Faults occurring in the yaw rate sensor are detected by the ESP control unit by evaluating the yaw rate signal as discussed below. The faults are set forth in the table of ESP Fault Codes at Tab 4.

e) The plausibility of a signal from the YRS is determined by comparing YRS signal information to signals from other sensors including: wheel-speed sensors, steering angle sensor, and lateral acceleration sensors. Additional information on signal plausibility is included in the materials at Tab 4 and in response to Request No. 16.

f) The general design and function of the ESP-System is described in the materials at Tab 4. The only controller able to actively build up brake pressure in response to the yaw rate signal is the ESP controller itself, which is called the active yaw controller.

The active yaw controller registers and assesses the vehicle's lateral dynamics. The active yaw controller maintains or restores the stability of the vehicle by influencing the longitudinal and lateral force of one or more tires within the given physical limits.

The activation and control of brake intervention is based on a yaw rate comparison between the measured yaw rate (from the yaw rate sensor) and the calculated yaw rate. The calculated yaw rate is a yaw rate calculated by the driver's input (steering wheel angle) and the vehicle velocity. The so-called single track model reflects vehicle behavior in a stable range. The deviation between the measured yaw rate and reference yaw rate is evaluated by the active yaw controller and an activation decision is made based on that comparison. System activation occurs during so-called "under-steering" and "over-steering" events as explained below:

***Over-steering Events*** (measured yaw rate higher than calculated reference yaw rate):

- Activation determination: The deviation between the measured yaw rate and calculated reference yaw rate is above the over-steer activation thresholds.
- Wheel controller determines whether the driver is braking or not:
  - *Without* driver braking, an active pressure build up is calculated and performed for the outside front wheel.
  - *With* driver braking, a pressure reduction is performed at the inside rear wheel. If necessary, an additional pressure increase (to the driver's braking pressure) is performed at the outside front wheel.
  - The slip controller always limits brake pressure in order to prevent loss of tire traction or wheel lockup depending on friction and pressure.
- The active yaw control is performed until the vehicle reaches a stable range again. This range is reached when the yaw rate deviation is below the deactivation thresholds (which are 50% of the activation thresholds).

***Under-steering Events*** (measured yaw rate is lower than calculated reference yaw rate):

- Activation determination: The absolute deviation between the measured yaw rate and calculated reference yaw rate is above the under-steering activation thresholds.
- Wheel controller determines whether the driver is braking or not:
  - *Without* driver braking, an active pressure build up is calculated and performed for the inside rear wheel.
  - *With* driver braking, a slight pressure reduction is performed at the outside front wheel.

- The active yaw control is performed until the vehicle reaches a stable range again. This range is reached when the yaw rate deviation is below the deactivation thresholds (which are 50% of the activation thresholds).

***Driver information*** A continuous ESP brake intervention without driver braking is shown by the flashing ESP indicator light (yellow triangle) in the instrument cluster. During an ESP brake intervention with driver braking, no flashing indicator light occurs. Depending on the intensity of brake intervention, the driver may hear the noise of the hydraulic pump.

g) The yaw rate sensor is located underneath the center console structure, on the drive shaft tunnel, in front of the selector lever shift module in the direction of travel. A photo illustrating the location is included at Tab 7.

***Request No. 15:*** *Provide the following information regarding the vehicles in the referenced VOQ's:*

*a. Copies of the repair orders for the two repair attempts made on VOQ 10176935 to correct inappropriate ESP selective brake application (allegedly one repair to the brake switch and one repair to the yaw rate sensor, both on the same or consecutive days, as indicated by interview with the complainant). Include all notes, procedures and diagnostic read-outs that are included on, or associated with, the repair order, from the technician, service advisor, customer or from any other source;*
*b. Warranty histories for VIN 4JGAB54E9YA[redacted] (VOQ 10155050) and VIN serial number ending -1A[redacted] ([redacted]case no. 0240050458); and*
*c. Provide Mercedes-Benz's assessment of any and all faults of the following subject vehicles systems/components that can cause a single rear-wheel to lock-up without application of the service brakes by the driver: (a) the ABS control unit; and (b) the subject system.*

**Response to Request No. 15:**

The repair orders for the repairs referenced in VOQ10176935, and the warranty histories for VIN 4JGAB54E9YA[redacted] (VOQ 10155050) and VIN serial number ending - 1A[redacted] (Delfi-case no. 0240050458) are included at Tab 8.

With respect to Request No. 15(c), Mercedes-Benz is not aware of any faults of the ESP or ABS control system that can cause a single rear-wheel lock-up with or without application of the service brakes by the driver.

The ABS control unit is not capable of causing a single rear-wheel lock-up without application of the brakes by the driver. The ABS system is not capable of initiating *any* independent brake pressure applications. The ABS system functions by monitoring wheel speed during brake applications by the driver, and *reducing* brake pressure on individual wheels as needed to maintain traction. The ABS control system is not capable of increasing brake caliper pressure in response to any sensor input.

Likewise, the subject ESP system is not capable of causing a rear wheel lock-up. The ESP system, while it can increase or initiate brake caliper pressure, includes "active slip control" technology, that automatically *reduces* the brake caliper pressure if the wheel speed sensor indicates that the wheel speed of the braked wheel, in comparison to the other wheels, is approaching a loss of traction or skid. This causes a release of ESP brake pressure before a wheel "lock-up" can occur on any of the four wheels. Moreover, none of the six NHTSA VOQ complaints would result in even application of either of the rear brakes. In each case, the customer reported activation while driving in a straight line without brake application. Where a Gradient or Electrical sensor fault occurs while the steering wheel angle indicates straight-line driving, the active yaw controller could momentarily (less than 320 ms) respond to an over-steering indication, which would only trigger a front wheel brake intervention.

***Request No. 16:*** *Furnish Mercedes-Benz's assessment of the alleged defect in the subject vehicles, including:*

*a. The causal or contributory factor(s);*
*b. The failure mechanism(s);*
*c. The failure mode(s);*
*d. The risk to motor vehicle safety that it poses; and*
*e. The reports included with this inquiry.*

**Response to Request No. 16:**

The same MK-20 generation ESP system from Continental Teves was installed in approximately 1.1 million Mercedes-Benz vehicles world-wide between 1997 and 2002. The warranty claims rate on the YRS in subject U.S. vehicles is 0.5%. The same MK-20 generation system and YRS has been used by other European vehicle manufactures with a similar YRS warranty claims rates, according to the supplier.

The only types of YRS related failures that Mercedes-Benz is aware of in the subject vehicles, and the only types of failures that have ever been observed in vehicles, are the five monitored failure modes discussed in response to Request No. 14, specifically: C1120-06 (Gradient Fault); C1120-20 (Electrical Sensor Fault); C1120-04 (Signal Plausibility Fault), C1120-09 (Standstill Plausibility Faults); C1120-08 (Offset Fault). These are the same fault codes that were stored in the vehicles that were the subject of the VOQ complaints NHTSA initially provided to Mercedes-Benz. Repair records are required to be maintained for one year from the date of service. Records for all five of the referenced vehicles that were serviced within the last year had C1120 fault codes documented. For the sixth vehicle, which was repaired in 2005, the same documentation does not exist, but other evidence discussed below indicates that a C1120 code was also most likely present in that vehicle at the time of repair.

*Failure Modes With No Brake Intervention*

Of the five types of YRS fault codes, three cannot be associated with an ESP brake intervention event under any circumstances. Specifically, for Standstill Plausibility Faults (C1120-09); Signal Plausibility Faults (C1120-04); and Offset Faults (C-1120-08) there is no possibility of brake intervention.

A *Standstill Plausibility Fault* (C1120-09) occurs where the YRS output signal is measured and found to be impermissibly high for a stationary vehicle, this reading registers a fault code, and the active yaw controller is disabled. Standstill plausibility monitoring is only conducted while the vehicle is stationary, so this error can't be recorded while the vehicle is in motion. Moreover, the active yaw controller is only activated at speeds over 10 km/h.

Likewise, for *Signal Plausibility Fault* monitoring (C1120-04) the YRS signal output is compared against inputs from the wheel speed sensors, steering angle sensor, and lateral acceleration sensor, and where a fault is recognized the active yaw controller is disabled and fault code is stored. Implausible signals that trigger the 1120-04 fault code deactivate the active yaw control before a brake intervention can occur.

Similarly, *Offset Fault* monitoring (C1120-8) is only used to calibrate the YRS. It is not used to generate signals to the active yaw controller that could ever trigger a braking event. Offset monitoring measures the YRS output signal when the vehicle is driving straight-ahead, and compares that to a calculated zero-point for accuracy. If the calculated zero-point of the YRS is outside the specified range, the active yaw control function is disabled and a fault code is stored. Again the offset comparison to the zero point is not a part of the active yaw rate control circuit, it is a calibration check that cannot cause a brake intervention.

*Failure Modes With Potential For Minor Brake Interventions*

Of the five types of YRS fault codes, only two can potentially result in minor brake interventions of limited duration, with limited brake pressure.

*Electrical Sensor Faults* (C1120-20) can be associated with brief ESP brake intervention events that last no more than 320 milliseconds (ms) and generate a maximum of 45-bar peak internal braking pressure. Electrical Sensor Faults occur when the signal voltage from the YRS is outside the permissible signal range. This can be caused by failure of the YRS itself, of shorts in the signal path. This fault results in shut-down of the active yaw controller, illumination of the ESP MIL, and entry of fault code C1120-20. Depending on the yaw rate gradient at the time of the fault, a brief brake intervention of no more than 45-bar, and lasting no more than 320 ms can occur.

*Gradient Monitoring Faults* (C1120-06) can be associated with brake interventions of up to 25-bar, and lasting less than 150 ms. Gradient faults result where the YRS output voltage jumps or spikes above the gradient level parameter. The total fault recognition and confirmation check takes no more than 150 ms before the active yaw controller is deactivated.

*Complaints Received by NHTSA*

The following is a summary of Mercedes-Benz's analysis of the six customer complaints provided by NHTSA:

- VIN 4JGAB54E81A[redacted] This customer alleged that: "The right rear wheel locked without warning sending my ML320 Mercedes Benz skidding across two lanes barely avoiding a deadly crash. The dealership has diagnosed the problem but refuses to fix it."

  DAS malfunction diagnosis at MB dealer no. 14320 on December 20, 2006 found two error codes, C1120-06 and C1120-09. As noted above, the C1120-09 (standstill plausibility) error code is not associated with faults that could cause a braking intervention, but the C1120-06 (Gradient Fault) error code could be associated with a braking intervention that could last as long as 150 ms, with a maximum brake pressure of less than 25-bar. In response to PE07-007, Mercedes-Benz has tested vehicles at highway speeds by simulating the worst-case scenario for a gradient fault, and found the impact on vehicle control associated with 150 ms brake interventions of less than 25-bar to be minimal. In fact, brake interventions of this duration and pressure level are barely detectable. It is not possible for a 150 ms brake intervention at highway speeds to cause a "locked" wheel condition as alleged by the customer. This type of brake intervention would also not cause the vehicle to skid across two lanes of traffic. Mercedes-Benz has tried to recreate the failure mode experienced by this customer, but has not been able to verify or substantiate the alleged loss of control, and in fact, Mercedes-Benz's road testing has found the opposite, which is that there is no loss of control associated with such brake interventions. This customer's vehicle was beyond the 4-year/50,000 mile warranty period.

- VIN 4JGAB54E6YA[redacted] This customer alleged that: "My 2000 ML with 47K miles suddenly locked on the brakes. The ESP light had been showing on very rare occasions for 2 months. I had three instances of sudden lock-up of one or more tires before the dealer found that the "yaw sensor" had failed."

  DAS malfunction diagnosis at MB dealer no. 14323 on December 15, 2006 found error code C1120, but the technician did not record a further diagnostic query to identify a sub-code. As noted above, there are two C1120 sub-codes that could be associated with inadvertent braking, C1120-06 (Gradient Faults) and C1120-20 (Electrical Sensor Faults). Mercedes-Benz, cannot confirm which type of fault occurred with this vehicle. But for the purpose of testing a worst-case scenario for C1120 faults, Mercedes-Benz has tested vehicles at highway speeds by simulating the worst-case scenario for an electrical sensor fault, and found the impact on vehicle control associated with 320 ms brake interventions of less than 45-bar to be minimal. Brake interventions of this duration and pressure level were detectable by the driver, and required a steering wheel correction similar to that required when encountering a cross-wind at highway speeds. It is not possible for such for a 320 ms brake interventions at highway speeds to cause a wheel "lock-up" as alleged by the customer. As noted earlier, the ESP active slip control and

limited brake pressure would not allow the wheel to lock-up into a full skid at highway speeds as alleged. Mercedes-Benz has tried to recreate the failure mode experienced by customers with electrical faults, but has not been able to verify or substantiate the potential for a loss of control with this condition. In fact, Mercedes-Benz's road-testing of 320 ms brake interventions indicates the opposite of this allegation, which is that there is no wheel lock-up. Consistent with Mercedes-Benz's findings, this customer does not allege a loss of vehicle control during such events. This customer's vehicle was beyond the 4-year/50,000 mile warranty period.

- VIN 4JGAB54E91A[redacted] This customer alleged that: "while driving 10 MPH, the ABS activated without the brake pedal being depressed. This stopped the vehicle, and caused a complete stalling of the engine and electrical system."

  As noted in response to Request No. 15, ABS regulation only occurs when the driver presses the brake pedal, and when activated, results in a reduction of brake pressure on a wheel with less traction, there is no increase in brake caliper pressure.

  DAS malfunction diagnosis at MB dealer no. 05101 on December 5, 2006 found two error codes, C1120-06 and C1120-09. As noted above, the C1120-09 (standstill plausibility) error code is not associated with faults that could cause a braking intervention, but the C1120-06 (Gradient Fault) error code could be associated with a braking intervention that could last as long as 150 ms, with a maximum brake pressure of less than 25-bar. As noted above, vehicle testing of 150 ms brake interventions of less than 25-bar found them to be barely detectable. Consistent with Mercedes-Benz's testing, this customer does not allege a loss of control. This customer's vehicle was beyond the 4-year/50,000 mile warranty period.

- VIN 4JGAB72EX1A[redacted] This customer alleged that: "while driving various speeds, a warning light illuminated on the dash and the brakes locked without depressing the brake pedal. When it was turned off and restarted, the vehicle was drivable."

  DAS malfunction diagnosis at MB dealer no. 14125 on November 25, 2006 found error code C1120, but the technician did not record a further diagnostic query to identify a sub-code. As noted above, there are two C1120 sub codes that could be associated with inadvertent braking, C1120-06 (Gradient Faults) and C1120-20 (Electrical Sensor Faults). Mercedes-Benz, cannot confirm which type of fault occurred with this vehicle, but as noted above, the worst-case has been tested and was found to result in minimal impact on vehicle control. Consistent with that testing, this customer does not allege interference with vehicle control. This customer's vehicle was beyond the 4-year/50,000 mile warranty period.

- VIN 4JGAB54E9YA[redacted] This customer alleged that: "BAS/ESP light comes on, brakes engage, steering wheel turns to the right . . . happens at speeds 60 MPH and higher; car difficult to control, no warning" "SUV has done this on expressway driving over and over for the past 6 years"

Warranty records indicate that the YRS was replaced on this vehicle in November, 2005, which is the same month indicated as the "incident date" in the VOQ document. DAS data is not available for this repair, but based on other information in the repair history, Mercedes-Benz believes that error code C1120 was most likely recorded in the ECU at the time of this repair. YRS sensor replacement is triggered under service procedures by the appearance of a C1120 error code for the YRS. Similarly, the customer indication that the ESP/BAS MIL illuminated also indicates that a C1120 has occurred, since MIL illumination always results in recording of an error code. As noted above, in the event of a worst case electrical sensor fault, a brake intervention of 320 ms, and 45-bar could occur, which would not result in a loss of vehicle control. Consistent with Mercedes-Benz's road testing, this customer does not allege a loss of vehicle control associated with any of the numerous alleged failures over the last 6 years. This customer's vehicle was beyond the 4-year/50,000 mile warranty period.

- VIN ending in A[redacted] The Delfi complaint states: "Brake assist & ESP (BAS/ESP)/illuminates///// Brakes apply on their own and ESP MIL illuminates/ fwy driving going straight one of the two times this happened"

  DAS malfunction diagnosis at MB dealer no. 14320 on December 20, 2006 found error codes C1120-04, C1120-20, C1120-06, and C1120-09. As noted above, the longest brake intervention that can be associated with these codes would be the 320 ms intervention that can be associated with a worst-case instance of C1120-20 (Electrical Sensor Faults). As noted above the maximum electrical fault brake intervention has been road tested by Mercedes-Benz and found to result in minimal impact on vehicle control, which is consistent with this Delfi complaint which does not indicate a loss of vehicle control. This customer's vehicle was beyond the 4-year/50,000 mile warranty period.

*Risk to Motor Vehicle Safety*

The impact on vehicle control associated with C1120-06 and C1120-20 faults is minimal. Theses faults are of limited duration and generate limited brake pressure application. Even in the case of an Electrical Sensor Fault, the brake application will be no more than 320 ms, and 45-bar, even in a worst case scenario. The impacts on vehicle control of this level of brake intervention is minimal. Amateur drivers who have experienced highway-speed simulations for the first time describe the steering-wheel response as similar to the feeling of driving down an interstate through a brief cross-wind, and the level of steering wheel correction is similar.

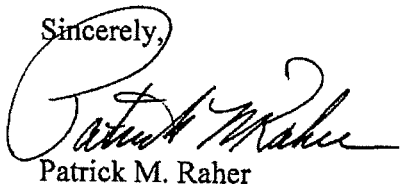
As noted in the response to Request No 14, there are theoretical ESP faults in any ESP system, including the MK-20, that could result in different levels of brake pressure and longer brake applications, which were analyzed during the development and FMEA process. These theoretically instances were projected to be extremely rare, with a very low theoretical occurrence rate. To date, Mercedes-Benz is not aware of any such occurrences ever happening in the field, either with customers or in Mercedes-Benz's own vehicle testing. The six complaints referenced by NHTSA were demonstrably the result of detected and recorded faults with a known severity level, and are not examples of such theoretical occurrences. Even if other

theoretical faults did occur, vehicle control would be maintained due to the moderate peak levels of brake caliper pressure that can be generated by the ESP system, and due to the brake-force reduction response triggered by the ESP's active slip control. As noted in response to Request No. 2, there have been no reports referencing a vehicle crash or actual loss of control.

Mercedes-Benz is continuing to monitor its customer complaints and dealer network for evidence of a defect trend related to ESP interventions with greater impact on vehicle control than those reported to date, and will take appropriate investigative actions with respect to any such complaints or claims.

Please do not hesitate to contact us if you have any questions about this submission.

Sincerely,



Patrick M. Raher