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OFFICE OF
INVESTIGATION

October 3, 2005

VIA FACSIMILE AND FEDERAL EXPRESS

Ms. Kathleen DeMeter
Office of Defects Investigation
National Highway Traffic Safety Administration
400 Seventh St., SW
Washington, DC 20890

Re: EA 05-005, Response of Texas Instruments, Inc. to Your August 31, 2005 Information Request

Dear Ms. DeMeter:

This will respond on behalf of Texas Instruments, Inc. ("TI") to your August 31, 2005 Information Request letter. To prepare this response, TI has reviewed relevant materials and compiled information from knowledgeable TI personnel. A disk which contains a copy of this response in MS Word 2000 format is also enclosed, as per the instructions in your letter.

To the extent indicated in its responses below to the specific questions posed in the August 31 letter, TI will produce responsive documents to NHTSA. These documents will be bates labeled and numbered consecutively beginning with "TI NHT05 00001". TI also will produce a privilege log identifying documents responsive to the requests that are protected by the attorney client and work product privileges.

At various points in this letter, we identify documents that are not being produced, but that TI is prepared to produce should NHTSA be interested in reviewing such documents. TI reiterates its previous offers to assist NHTSA and, in that regard, is also prepared to further discuss with you and your colleagues any matter relative to your inquiry or this letter that you believe may warrant further elucidation or clarification.

The "subject switch," as defined in your August 31 letter, consists of "All Speed Control Deactivation Switches manufactured by Texas Instruments for use in the subject vehicles or vehicles included in the subject recall." The "subject vehicles" are defined as "all MY 1995-2002 Ford F-150, Ford Expedition and Lincoln Navigator vehicles" and the "subject recall" is defined as NHTSA Recall No. 05V-017 (Ford Recall No. 05S28)", which embraced MY 2000 Ford F-150, Ford Expedition and Lincoln Navigator and certain 2001 MY F150 Supercrew vehicles built through August 7, 2000.

TI only manufactured one "subject switch" for the subject vehicles and for those vehicles embraced in the subject recall. That switch was at all times assigned number 77PSL3-3 by TI.¹ TI understands that the corresponding Ford part number for the subject switch was F3TA-9F924-CA and that the same switch was also used in other vehicles during the 1995-2002 time period, including Ford Diesel Trucks, Rangers, Explorers, and Broncos.

The subject switch is a hydraulic pressure switch that functions as one component in the vehicle's electrical and braking systems. The switch acts as a redundant cruise control deactivation mechanism in all of the subject vehicles. The switch converts pressure from brake fluid into an electrical switching action and is designed to deactivate the vehicle's cruise control when the driver applies the brakes. The switch is screwed into the master cylinder, which is filled with brake fluid. The fluid enters the hydraulic part of the switch and presses against a seal or diaphragm. The diaphragm is composed of three layers of Kapton, each layer of which is coated on both sides with Teflon (Kapton 500FN131). The Kapton and the Teflon are manufactured by Dupont.

When a driver of a vehicle equipped with the switch presses on the brake pedal, there is an increase in the pressure of the brake fluid pressing against the switch's diaphragm. This pressure increase is transferred to a converter in the switch, causing a spring arm in the switch to move into an open position at a designed-in pressure. This open circuit between the switch terminals prevents current flow to elements of the cruise control system, thereby disengaging the cruise control.

The 77PSL3-3 switch was designed to serve the same purpose as the 77PSL2-1 and 77PSL3-1 switches addressed in TI's letter to you of September 10, 2003 ("September 2003 Letter"). That letter was prepared in connection with NHTSA's now-closed investigation in EA02-025 of fires in certain other Ford vehicles, namely, the Lincoln Towncar, Ford Crown Victoria and Mercury Marquis ("Passenger Car Investigation"). The 77PSL2-1 switch was used in the Lincoln Towncars and the 77PSL3-1 in the Mercury Grand Marquis and Ford Crown Victoria vehicles at issue in the Passenger Car Investigation. There are some physical differences between those passenger car switches and the 77PSL3-3 switch. Specifically, the connector used in the 77PSL3-3 has a different color and a different location for the "key" on the outside of the connector used to ensure that the switch is connected to the correct part on the vehicle. Also, due to the different actuation pressure of the 77PSL3-3, that switch's cup size is different from that of the passenger car switches. A chart that reflects these differences between the 77PSL3-3 and the passenger car switches is attached as Exhibit 1 to this letter.

TI does not believe that the subject switches constitute a safety defect, as also discussed further below.

¹ As discussed further below, the subject switch is the quiet version of the 77PSL3-3, which TI began manufacturing and supplying to Ford in early 1993, replacing a noisier or "snap" version of that switch and the 77PSL2-3 switch, also used in certain vehicles prior to 1993.

- 1. Provide copies of all engineering standards, specifications, quality control documents, and detail drawings related to the subject switches or their sub-components.**

As noted, the subject switch is assigned TI number 77PSL3-3. The Ford engineering standards and specifications, as well as the TI quality control documents for this switch, are the same as those for the 77PSL2-1 and 77PSL3-1 passenger car switches, other than with respect to items that require vehicle-to-vehicle customization, for example, actuation pressure and sealing method. Accordingly, with respect to standards and specifications, and quality control documents, TI refers NHTSA to the documents that it produced in connection with its answer to question 2 of the September 2003 Letter.

Relevant quality control documents are also being produced at this time. These quality control documents reflect procedures to ensure quality control on the manufacturing line used to produce the 77PSL3-3 switch and other switches, as well as revisions to those procedures over time. The timing of such revisions is indicated on the documents.

With respect to those items that require vehicle customization, these are specified by Ford on the detail drawings of the 77PSL3-3 switch, which are being submitted by TI. Some of these drawings are marked to indicate that they reflect revisions from earlier drawings to show modest changes made to the switch during the course of its production. Such revisions take into account, for example, changes to components. (See response to question 7, below.) These drawings indicate whether they were prepared by Ford, TI or Ford's Tier One suppliers.

- 2. Describe, and provide copies of all documents relating to, all design verification and validation tests that relate in any way to the durability of the subject switch or its sub-components.**

TI understands this question to request pre-production verification and validation testing consistent with the general understanding of those terms within the automobile parts manufacturing industry. Response to question 3 in TI's September 2003 Letter describes the initial design and testing process that was undertaken to develop the 77PSL2-1 switch from 1989 through 1991. That response applies as well to the 77PSL3-3 switch and accordingly is incorporated by reference into this answer. However, the 1991 manual/automatic crimping machine issue described in the third paragraph of page 4 of TI's September 2003 Letter is not relevant to the 77PSL3-3 switch, which entered production after the crimping event described in the 2003 Letter. Further, documents are being produced which describe the initial design verification and validation tests, including durability tests, that were undertaken for the 77PSL3-3 switch.

TI developed a quiet version of the 77PSL3-3 switch in 1992 and began supplying these quiet switches to Ford in early 1993, replacing the snap version of the 77PSL3-3 switch. To the best of TI's knowledge, only that quiet version of the switch was installed by Ford in the subject

vehicles. Testing and validation documents relating to the development of the 77PSL3-3 quiet switch are being produced with this letter.

Additional design and verification testing was performed in connection with certain changes to the 77PSL3-3 switch that are described in response to question 7 below. Documents produced in response to this question and to question 7 address the relevant testing associated with such changes.

- 3. Provide a chronology of all events relating to the initial testing and supply of the subject switches for MY 1993 through 2002 Ford F150, Expedition, and Lincoln Navigator vehicles (including all prototype and pre-test designs) and of the subsequent investigation that led to the subject recall.**

See response to question 2, above and TI's response to question 4 in the September 2003 Letter for a discussion of the initial testing of the 77PSL family of switches.

TI began supplying the 77PSL3-3 switches for the subject vehicles (and other Ford vehicles, namely, Diesel F-Series trucks, Broncos, Rangers and Explorers) at the end of 1992 for initial use in MY 1993 vehicles. Prior to that time, TI had provided to Ford, on several occasions, prototypes and pre-test designs of the subject switches. Documents reflecting the provision of these prototype or pre-test design switches are being provided to NHTSA.

At all times following the production of the subject switches, the switches were supplied either to Tier One suppliers (specifically, Tokico or Bosch Systems), or (with respect to replacement parts and therefore in more modest numbers) directly to Ford Motor Company and Ford Motor Company of Canada. Over 14.8 million of these switches were manufactured by TI for use in the subject and other vehicles between MYs 1992-2002, as reflected on Exhibit 1, page 2, attached to TI's September 2003 Letter. Exhibit 4 to this letter identifies the number of switches supplied on a monthly basis to each of the above entities beginning in the calendar year 2001 and later. See response to question 15, below.

TI understands that the Tier One suppliers assembled the switch with the master cylinder and supplied the entire assembly to Ford. TI did not experience any significant number of complaints about the switch or its operation during the period of its supply. Nor were any meaningful number of subject switches returned to TI for any type of problem.

TI ceased supplying the subject switches as original equipment to Ford in 2002. The last model year vehicles on which they were used is, to TI's knowledge, MY 2002, although Ford is in the best position to know whether the switch was used in any MY 2003 Ford vehicles. Relevant documents pertaining to the termination of TI's supply of the switches to Ford for use as original equipment on Ford vehicles is being produced in response to questions 10 and 17 below. TI has continued supplying the switch to Ford for use as a replacement part. In 2003, TI supplied 54,960 77PSL3-3 switches for replacement parts. In 2004, TI supplied 60,600 77PSL3-

3 switches as replacement parts. For calendar 2005, as of early September 2005, TI has supplied 19,190 switches as replacement parts.

TI had no role in any investigation that led to the "subject recall," as that term is defined in your August 31 letter. Prior to that recall, TI offered to assist Ford and NHTSA in connection with their investigations. TI did supply some information to Ford about the manufacture of the switch which TI understands Ford requested in connection with either its own investigation or NHTSA's investigation. TI was never asked to undertake any testing jointly with Ford or NHTSA (although TI offered to do so). TI did not engage in any of its own testing relative to the subject recall. However, TI provided NHTSA a listing of recommended tests, a copy of which is being produced again in response to question 5 below, and met with NHTSA to elaborate on the tests that it believes the agency should conduct.

- 4. Describe, and provide copies of all documents relating to, all inspections, tests, and other analyses of subject switches. Provide a listing of all such switches that were inspected, tested, evaluated, or assessed by stating the vehicle's VIN, recall repair date, mileage at the recall repair date, switch part number, part serial number (identifying marking), part date of build, anomalies detected, and reason for specific switch analysis.**

See responses set forth in this letter to questions 2, 3 and 7, and documents produced in connection with those responses for information on testing of the subject switches. As was the case with the switches addressed in the Passenger Car Investigation and as discussed in the response to question 7 in TI's September 2003 Letter, TI conducted production testing of the 77PSL3-3 switch to ensure that the switches coming off the production line were consistent with Ford's specifications and TI's quality control standards. As part of its production testing, TI pulled approximately 5 switches from every 2,000 switches produced and subjected them to various tests, including cycle tests. These tests confirmed that the switches pulled from production lots consistently met manufacturing standards. TI produced a sampling of production lot testing reports in response to question 7 in the September 2003 Letter, and can produce all or a sampling of such documents for the 77PSL3-3 switch on request.

TI's litigation cause and origin experts have also photographed subject switches and subject vehicles when TI is put on notice of vehicular fires allegedly relating to 77PSL3-3 switches. Copies of TI's photographs, which are identified by case or claim, are being produced herewith. Attached as Exhibit 2 to this letter is a chart listing the name of the case or claim in which photographs are being produced, the type of vehicle, the date of loss, and the VIN number, if it is known. In many cases, the VIN number that TI is provided is inaccurate. To the extent that subject switches were x-rayed by plaintiffs' experts, those x-rays are also being produced. If experts produced reports or were deposed, those documents are also being produced.

In addition, during the course of the more than 10 years of production of the approximately 14 million 77PSL3-3 switches that TI produced for installation on the subject

vehicles, a relatively modest number of anomalous switches were discovered by TI or returned to TI by Ford or the Tier One entity to which TI supplied the switch. The existence of such anomalies is not unusual when such a large number of switches are being produced. With respect to each such switch that came to its attention, TI routinely prepared a report describing and analyzing the problem with the switch in order to ascertain the cause of the anomaly. Those reports that TI has been able to locate are being produced, as well as certain "Highlights" documents which describe certain of these switches.

TI has carefully reviewed the reports on these switches and has concluded that they were, in each case, the product of an isolated event limited to one or a limited number of switches. Further, all or most of the issues with these switches were discovered either before the switch was shipped by TI (because the switch failed some performance or other test administered by TI) or before it reached the inventory of switches installed by Ford on the subject vehicles. Thus, these anomalies do not offer an explanation for the "alleged defect," as that term is described in your August 31 letter. In fact, TI does not believe that there is any connection between any of the anomalies and the types of vehicle fires that NHTSA has identified as the basis for this investigation. Examples of some of these irregular switches, described further in documents supplied by TI, are as follows:

- In October 1993, TI was notified by Tokico of a thread quality issue that prevented efficient installation of the 77PSL3-3 switch (and two other pressure switches) onto the master cylinder. Subsequent analysis showed that the threads were being damaged at the point of manufacture. The problem was resolved by improvements in product handling. This problem is unrelated to internal leakage or the alleged defect.
- In November 1997, it came to TI's attention that a single 77PSL3-3 switch was returned for an inoperative condition. TI determined that the problem with this switch was the result of the miscalibration of the sensor assembly machine in the production line. Had this switch been installed in a vehicle, the cruise control would not have functioned due to the open circuit condition. The condition is unrelated to the alleged defect.
- In October 1999, TI discovered a switch returned from Tier One Bosch Braking Systems due to a portion of the Kapton diaphragm visibly appearing outside of the aluminum crimp ring. Following its investigation of this switch, TI determined that one of the Kapton stations on the manufacturing line was feeding in a double length of Kapton, thereby causing the condition noted above. Subsequent maintenance to the machine ensured that only single length pieces of Kapton were fed into the switch. While TI cannot quantify the number of switches with this condition, TI has no reason to believe that it was significant since the condition was obvious and few parts were returned evidencing this

phenomenon. It bears note that TI switches are visually inspected prior to shipment and therefore TI believes that any significant number of switches in which Kapton appeared outside the crimp ring would have been identified. As far as TI knows, no such switches entered Ford's inventory. TI does not believe that there is any relationship between these switches and the alleged defect.

- In late March 1999, during annual recertification testing, it was noted that three 77PS switches drifted slightly below specified actuation pressures after humidity and impulse testing. Devices were subsequently retested in the late spring and summer 1999 and it was determined that the switches ultimately passed these tests. The condition of low actuation pressure is unrelated to the alleged defect and is not causal to internal leakage within the switch.
 - In February 2000, TI was alerted by a Tier One supplier of a not-fully-crimped 77PSL3-3 switch and of an uncrimped switch. TI's subsequent investigation confirmed that these were isolated events that resulted from the mishandling of a small number of switches by manufacturing personnel. TI utilizes a sensor to confirm the proper crimp geometry of the switches. In this particular situation, these switches were not subjected to this sensor as a result of the mishandling. TI addressed the issue with operator re-training. TI does not believe that this was a widespread problem as no significant numbers of such switches were returned to TI. An uncrimped switch would have been inoperative. Neither an uncrimped nor partially crimped switch would have contributed to the alleged defect.
 - In April 2000 and in May 2001, an issue arose with faulty hexports in some 77PSL3-3 switches. TI determined that one or two lots of switches were manufactured with the hexport seal surface off-center, resulting in mating problems when the hexport was screwed into the master cylinder. The poor seal created by this mating problem resulted in a leakage from the switch at the point of mating with the master cylinder, but not internal leakage. TI resolved this problem by developing a centering gauge, *i.e.*, a pin that would be put in the hexport to determine if the mating seal surface was within specification and that would therefore solve the sealing problem. The hexport issue was unrelated to any internal leakage or to the alleged defect.
5. Describe all assessments, analyses, tests, test results, studies, surveys, simulations, investigations, inquiries, assessments and/or evaluations (collectively, "actions"), that relate to, or may relate to, the alleged defect in any of the subject switches, that

have been conducted, are being conducted, are planned, or are being planned by, or for, Texas Instruments. For each such action, provide the following information:

- a. Vehicle make, model, and model year for which the subject switch was or may be used;**
- b. Action title or identifier;**
- c. The actual or planned start date;**
- d. The actual or expected end date;**
- e. Brief summary of the subject and objective of the action;**
- f. Engineering group(s); supplier(s) responsible for designing and for conducting the action; and,**
- g. A brief summary of the findings and/or conclusions resulting from the action;**
- h. For each action identified, provide copies of all documents related to the action, regardless of whether the documents are in interim, draft, or final form. Organize the documents chronologically by action.**

TI has not undertaken any analyses of the 77PSL3-3 switch specifically with respect to the alleged defect, and is not currently planning or conducting any testing related to the alleged defect in the subject switches. Testing that TI undertook relative to the alleged defect in the switches at issue in the Passenger Car Investigation is described in response to questions 5 and 7 of TI's September 2003 Letter and reflected in documents produced in response to those questions with the September 2003 Letter.

TI's answer to question 5 of the September 2003 Letter states that TI's Steve Beringhause examined some switches returned from Ford's 1999 recall of certain passenger vehicles in 1999 and 2000. A small number of 77PSL3-3 switches were among those examined at that time. Such switches had apparently been inadvertently returned to Ford in response to the 1999 passenger car recall. The notes prepared by Mr. Beringhause on his examination of these and other switches were produced to NHTSA with TI's 2003 production of documents responsive to question 5 of the September 2003 Letter.

TI has previously provided to NHTSA its views on testing that the agency might undertake with respect to the alleged defect in the subject switches. A copy of its suggestions in that regard is being produced by TI.

Finally, the photographs described in response to question 4 above are responsive to this request as well.

- 6. Describe any situation, design, manufacturing process, or other issue that might have resulted in physical differences between any two subject switches. As part of this description please include the physical difference being described, the cause of the difference, and when the cause for the difference began and ended in production.**

Based on conversations with Mr. Bruce York of NHTSA's staff, TI understands that this question is focused on physical differences that may exist as between certain switches that are other than the result of purposeful design changes, which are described in response to question 7, below. TI has not studied in any depth the physical differences that may exist between 77PSL3-3 switches, and has no detailed list of such differences as may exist. Nor does TI believe that any such physical differences as may exist would affect the functioning or durability of the switch since such differences should be minor and largely cosmetic.

At the same time, TI appreciates that some physical differences may exist for a variety of reasons. A recent comparison by TI engineers of the outside of the few switches in TI's possession at its Attleboro, MA facility indicated slight variations in plating color (probably due to minor thickness differences) and some tool marks in the crimp area, probably due to minor variations in crimp tooling maintenance. When cut open, the only differences detected were some slight differences in the color of the arms and contacts, possibly due to variations in the heat and current to which these switches were subjected during testing. TI detected no differences in contact size among the switches it inspected.

As noted, TI is not aware of any physical differences in the switches that would have any bearing on the functioning or durability of the switches or on the alleged defect. All switches are designed to meet the Ford specifications, but given the nature of the manufacturing process it is not unusual for two switches that do meet those specifications to have very slight physical differences. Before switches enter the supply chain, they are subject to function tests and other checks following their manufacture in order to identify any improperly manufactured switches so that they are eliminated from the supply chain. Thus, any physical differences in switches supplied to Ford should have no bearing on the functionality of the switch.

With respect to the specific physical differences identified by NHTSA, TI understands that one of the differences relates to the location of indentations on the base of the switch, which varies as between certain switches. This difference is accounted for by the fact that the switches were produced in different cavities of the mold frame used by TI in the manufacturing process. These differences would have no bearing on the functioning of the switch and are entirely unrelated to the alleged defect.

NHTSA has also identified switches that have differing moveable contacts. Specifically, NHTSA identified a switch in which the top portion of the moveable contact appears to be silver

coated, in comparison to other switches in which the top portion of that contact is copper. TI has reviewed photos of these switches provided to it by NHTSA. Based on the review of these photos, it appears that the silver coated contact was the result of a supply anomaly in which TI's supplier of the moveable contact component provided a silver-coated part not consistent with specifications. TI does not have any information concerning the extent to which this anomaly may be reflected in other 77PSL3-3 switches that it manufactured. However, TI has not previously seen a switch in which the top portion of the moveable contact is silver coated and therefore has no reason to believe that this is or was a widespread phenomenon. TI does not believe that the use of a moveable contact in which the top portion is silver-coated would have any bearing on the functionality of the switch or that it would serve as a factor contributing to the alleged defect.

TI also believes that the use of a silver-coated top portion of the moveable contact could, if one assumes the lack of silver on the lower portion of the contact, reduce the expected life of the switch and that this could result in the cruise control of a vehicle equipped with such a switch becoming inoperable. This would occur due to an increased likelihood of an open circuit condition resulting from oxidation across the contacts if there were a lack of silver at the contact interface. Since TI has not inspected the switch at issue and has not seen the lower portion of the moveable contact, TI cannot draw any conclusions about the possible life expectancy of the switch shown in the NHTSA photographs. In any event, TI does not believe that the anomaly pictured in the NHTSA photos has any relationship to vehicle fires or other thermal events.

7. **Describe all modifications or changes made by, or on behalf of, Texas Instruments in the design, material composition, manufacture, quality control, supply, or installation of the subject switches or subject switch sub-components, from the start of production to date. 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 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.

TI does not interpret this question to apply to routine and minor adjustments to the manufacturing process made during that process, e.g., to the maintenance, lubrication and calibration of production machinery.

Certain modifications or changes to the design, manufacture or material composition of the 77PSL3-3 switch were submitted to Ford for approval during the period April 1991 through the current date. These changes were as follows:

April 1991 -- Change in terminal position dimension. TI requested, and Ford approved, an increase in the tolerances of the terminal position to reflect the dimensional capability of the switch. TI made this request following a study of actual manufacturing tolerances which indicated that the change was necessary to accommodate the parameters of the switch. This change occurred prior to full scale production and sale of the switch.

November 1991 -- Change in thread gauging specification. TI requested and Ford approved an increase in thread gauge specification from 2A to 3A, i.e., from a tighter to a looser tolerance. TI requested this change to meet industry standards for plated thread allowance. This change occurred prior to full scale production and sale of the switch.

January 1993 -- Conversion from "snap" to quiet switch. Ford requested, in response to consumer complaints, that TI develop a version of the switch which would operate without a snapping sound when the switch was activated. This change required dimensional changes in the snap acting disc. The snap and quiet versions of the switch are interchangeable. Once this change was implemented, TI ceased supplying the snap version of the switch.

March 1994 -- Switch to color pigments in plastic base using alternative material to comply with government regulations. This change was requested by Ford and was made in order to comply with hazardous materials regulations. The switches made prior to this change would have been interchangeable with the switches made subsequent to the change. However, once this change was implemented, TI ceased supplying the switch in a form that did not reflect this change.

February 1995 -- Change in steel type due to temporary interruption in supply of steel. This change was requested by TI because of earthquake-related supply interruptions from the Kobe Japan steel supplier for Textron, the manufacturer of the hexport component for the switch. This temporary change entailed moving from 10L10 steel to 10L07 steel used to make the hexports for the switch. The parts made before and after this change were interchangeable with one another. TI continued producing and selling switches with the 10L10 steel until the supply of such switches was exhausted.

February 1995 -- Addition of pressure tester. TI requested this change in order to increase its manufacturing capacity by bringing on an additional pressure testing machine to allow for this capacity growth. There was no change in the test procedure. This change had no impact on the design or manufacture of the switch.

September 2002 -- Change in hexport chromate plate to comply with environmental regulations. Ford requested this change in order to comply with new environmental regulations. The change entailed moving from a hexavalent chromium bond to a trivalent chromium bond. The parts manufactured before and after this change would have been interchangeable, but TI ceased producing and selling the hexavalent chromium parts after the change was implemented.

March 2004 -- Relocation of manufacturing facility from Attleboro, MA to Mexico. This was done at TI's request. The manufacturing process was transferred without any change to the design or manufacture of the switch. All of the 77PSL3-3 switches manufactured in Mexico are used for replacement parts.

To the extent that TI has so-called SREA and other documents in its possession that relate to these design or manufacturing changes, such documents are being supplied. To the extent available, warrant documents are being supplied which identify the date of implementation of each change noted above.

None of the changes led to a change in the part number supplied to the subject vehicles. The modified parts were made available as original equipment and service parts, except that TI believes that none of the switches supplied after MY 2002 were installed on Ford vehicles as original equipment. Ford is in a better position to confirm when it ceased installing switches as original equipment on its vehicles.

In addition, the detail drawings that are being produced in response to question 1 show other changes made to the design of the switch at various points during its production. Each of these revisions was approved by Ford.

Apart from the changes described above, there were some infrequent changes in suppliers of components. In all cases, these changes occurred after the switch ceased to be supplied to Ford for use as original equipment. These supplier changes are identified on the chart attached hereto as Exhibit 3 to this letter. There have been no changes to the manner in which the switch is supplied to Ford or to Tier One entities during the period that the switch has been manufactured.

With respect to changes to TI's quality control procedures during the period of the production of the 77PSL3-3 switch, relevant documents reflecting such changes are being produced in response to question 1, above.

TI has no information on changes to the installation of the switch, if by the term "installation" NHTSA is referring to its installation on Ford vehicles. There have been no

changes in the method that TI uses to install components of the switch into the switch from the beginning of production through the current date.

8. **Provide a detailed explanation of the extended cycle life switch design discussed in US Patent Number 5,932,857, dated August 3, 1999 (copy attached). As part of your response, please include:**
- a. **A detailed chronology of all events, meetings, communications, both internal to Texas Instruments and external, in which Texas Instruments was involved and which led or contributed to the Patent application of May 6, 1997 which resulted in the Patent award on August 3, 1999;**
 - b. **Any discussions or communications with Ford regarding the extended cycle life switch design described in Patent Number 5,932,857 and if no communications took place related to this topic, explain why not.**
 - c. **In chronological order 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 preparation or application for, or awarding of Patent Number 5,932,857. For each such action, provide the following information:**
 - i. **Action title or identifier;**
 - ii. **The actual or planned start date;**
 - iii. **The actual or expected end date;**
 - iv. **Brief summary of the subject and objective of the action;**
 - v. **Engineering group(s)/supplier(s) responsible for designing and for conducting the action; and**
 - vi. **A summary of the action activities, findings and/or conclusions.**

The patent that is the focus of this question evolved out of TI's on-going efforts to locate materials that might increase the number of its supply sources for the components used in its products, improve performance and reduce the cost of its products. However, as described further below, the invention described and claimed in that patent was not implemented as it did not prove to be of practical value to TI relative to the subject switches or the family of switches of which the subject switches are a part.

TI's family of 77PSL switches, using the Kapton FN product as a diaphragm, were meeting or exceeding the Ford specification tests during the period of their production and were not being returned in any meaningful numbers for warranty, safety or any other reasons. TI nonetheless undertook efforts beginning in the early 1990's to identify possible alternative diaphragm materials, consistent with its efforts described in the prior paragraph.

As relevant to the patent that is the subject of this question, testing by TI engineers of a variety of alternative diaphragm materials was undertaken in the summer of 1995 and continued on a periodic basis for the next several years. Cycle testing based on Ford-specified endurance schedules originally focused on a Kapton product with a different type of Teflon coating (perfluoroalkoxy), known as Kapton XP. TI discussed this product with Dupont at a July 28, 1995 meeting to gather certain information about Kapton XP material, including its nature, availability and cost.

TI's testing of Kapton XP was conducted largely in the summer and fall of 1995. TI also tested other potential alternative diaphragm materials simultaneously, notably Kapton coated with polytetrafluoroethylene (PTFE) and TALPA 2000, an annealed monolithic PEEK film. This testing yielded results offering information on the cycle life of the 77PSL switches using Kapton XP material and other materials tested in comparison to the cycle life of the switch using the Kapton FN material. A November 22, 1996 document that describes these tests, the conditions under which they were conducted and their results was produced by TI in September 2003 in connection with the Passenger Car Investigation and was assigned document number TI-NHTSA-021089-021110.

As a result of the tests conducted in 1995, TI determined that the use of alternative diaphragm films could yield improved switch cycle lives that might be appropriate for a variety of different types of switch applications. On the basis of the test results, an internal TI "Invention Disclosure" form dated January 17, 1996 was completed by the three TI engineers involved with the alternative diaphragm project. A copy of that document is being supplied by TI. The completion of this form set in motion internally at TI a process whereby claimed inventions are reviewed by applicable TI patent committee and TI patent counsel to make a determination on the basis of a variety of factors as to whether to pursue a patent application. In this particular case, the initial disclosure described in January 1996 was further amended by the TI engineers in May 1996. This, in turn, led to the drafting of a series of patent claims and ultimately a patent application, which was completed and filed with the U.S. Patent and Trademark Office ("PTO") on May 6, 1997. This patent application, as initially filed, consisted of eight claims concerning the use of films as diaphragms.

TI ultimately determined that while Kapton XP offered some advantages in terms of cycle life, it did not satisfy some of the key goals sought to be attained through the testing of alternative materials. Specifically, Kapton XP did not resolve TI's reliance on Dupont as a sole source of the material used for the switch diaphragm. Further, TI determined that Kapton XP was actually a higher priced product than Kapton FN. Thus, since Kapton XP failed two

measures for an alternative diaphragm (broadening supply sources and reducing costs), and in view the fact that the switch continued to meet or exceed Ford's specifications with Kapton FN, TI did not further consider Kapton XP as an alternative material.

During the time period from the receipt of the first disclosure to the filing of the patent application on May 6, 1997, TI continued its testing of alternative diaphragm materials. One of these was a material that came to its attention known as Torelina PPS, a biaxially-oriented material made by the Toray Company in Japan. TI first received a sample of this material in October 1996. Torelina was not designed by its manufacturer for use as a diaphragm material. Nonetheless, TI began cycle and endurance testing with Torelina in October 1996. In addition, tests were conducted on the exposure of the material to brake fluid, as well as temperature exposure and tensile elongation tests. Further specific information on this testing and the results are described in documents, including confidential documents, that TI produced in response to question No. 7 in connection with the 2003 Investigation.

The fall 1996 testing by TI of the initial Torelina product that TI had received yielded generally encouraging results in terms of the number of cycles to which the product could be successfully exposed. In April 1997, additional Torelina material was received by TI from Toray. Cycle testing of that material, however, yielded less satisfactory results. TI determined that the resin used in material received in April 1997 was different from the resin used in the Torelina sample that TI tested in 1996, and that Toray no longer was making the same type of Torelina as was supplied in 1996. TI conducted further testing of Torelina with additional sample material received from Toray in June 1997. These tests also did not yield satisfactory results. A new batch of Torelina was received and tested in January 1998. Among other tests, Dynamic Mechanical Analysis testing was performed on this material.

TI determined that the April and June 1997 results showed an inconsistency in the cycle life performance of the material. Further study of the material showed that it displayed different crystalline structures from lot to lot and that these differing structures were the result of variations in the resins used in different lots of the material. A TI representative met with Toray at its offices in Japan in September 1997. At that meeting, TI obtained further information about the nature of Torelina (which is a product oriented toward electrical rather than mechanical uses) and learned that Torelina is not subjected to any mechanical testing by Toray. Further, TI became aware at that time of the unavailability of Torelina for sale in smaller volumes more suitable to TI's needs.

In April 1998, TI received an Office Action from the PTO that the claims submitted with the May 1997 patent application were rejected, in part because of issues relating to the patentability of the invention described in the May 1997 application. These patentability questions were, to a substantial degree, rooted in the fact that the claims were focused on the use of a Kapton product (Kapton XP) as a diaphragm that was not fundamentally different from the product that had been in use by TI for several years in its production of the 77PSL family of switches (Kapton FN).

In response to the Office Action by the PTO, TI engineers and counsel consulted about further steps to secure a patent. A decision by necessity was made in May 1998 to modify the application in order to focus the claims on the use of Torelina as a diaphragm material. By that time, TI had identified certain concerns with Torelina, notably its inconsistent performance due to the variability of the resins used in its manufacture. (TI also determined that Torelina offered no significant cost advantage over Kapton FN.) Nonetheless, TI decided that there might be some potential for the use of Torelina in certain switch applications at some future point and that it was therefore appropriate to proceed with the modified patent application based on the use of Torelina or some similar biaxially-oriented material as a potential diaphragm. Amended patent claims were accordingly filed in June 1998. A copy of these amended claims is being submitted by TI. The PTO advised TI that the amended patent application would be allowed in August 1998. Patent Number 5,932,857 was issued about one year later, in August 1999.

TI conducted renewed cycle testing of Torelina in December 1998, using a larger sample size than was used previously. The goal was to generate more comprehensive test results in order to determine Torelina's suitability as a diaphragm for either the 77PSL family of switches or other switches produced by TI, including an air conditioning switch and a transmission switch supplied to another vehicle manufacturer. The tests undertaken in late 1998 were derived from Ford's specifications and included tests addressing calibration, proof, impulse, burst, vacuum, temperature, cycle and material comparison tests, which are described in a document that TI is producing. The testing yielded generally poor results, with high leakage rates and evidence that Torelina was unable to withstand higher temperatures. TI did not thereafter continue any further testing of Torelina in connection with the development of a possible alternative diaphragm material for the 77PSL switches. (There was some further consideration given to the use of Torelina in 2001 in connection with a different type of switch being considered for a time for use by a vehicle manufacturer other than Ford. However, that switch was never ordered or produced.) Documents relating to the testing of Torelina, other than those previously produced by TI in connection with the Passenger Car Investigation, will be made available to NHTSA on request.

Since the patent application had no bearing on TI's continued supply, or plans for future supply, of the 77PSL family of switches to Ford, TI did not discuss the patent application with Ford. In that regard, it bears note that Ford had never asked TI to change the material used in the diaphragm of any of those switches. Nor did Ford at any point during the period that the patent application was prepared and prosecuted advise TI that there was any quality or other issue with those switches. Given that fact and the fact the switches continued to meet Ford's specifications at a commercially acceptable cost per switch, none of the alternative diaphragm materials described in the patent application were ever deemed to warrant further consideration for use in the TI-produced cruise control deactivation switches.

TI also did not discuss the patent application with any other entity outside TI. As indicated above, TI did discuss issues pertaining to the characteristics, cost and availability of

Kapton XP and Torelina with Dupont and Toray, respectively.

9. **Following the May 6, 1997 filing application which lead to the award of Patent Number 5,932,857, describe all modifications or changes made by, or on behalf of, Texas Instruments in the design, material composition, manufacture and/or fabrication, quality control, supply, or installation of the subject switches, which relate to, or may relate to the alleged defect. 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 switch 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.**

If modifications or changes as described in the Patent Number 5,932,857 were not made to the SCDS, state so and explain why they were not.

No modifications to the 77PSL3-3 switch were made as a result of the patent. As explained in response to question 8, above, the biaxially-oriented Torelina which was the subject of the patent claims was determined by subsequent testing to have various problems that rendered it unsuitable for use as an alternative to Kapton FN. These included inconsistencies in the product's crystalline structure from lot to lot, which led to insufficiently consistent results in durability testing and issues with the product's susceptibility to high temperatures. As also noted above, Kapton XP was not further considered by TI as an alternative diaphragm material for the reasons stated in response to question 8, above.

10. **Provide copies of all documents or communications between Texas Instruments and Ford regarding the alleged defect in the subject switches. Organize the document copies in chronological order.**

TI is producing in chronological order documents reflecting communications with Ford regarding the alleged defect in the subject switches, including correspondence, e-mails, and any notes of meetings and telephone calls. TI interprets this request to exclude general commercial communications, as well as litigation or mediation-related communications. Further, TI refers NHTSA to documents previously produced by TI in response to question 9 in connection with TI's September 2003 Letter. TI is requesting confidentiality in connection with certain of these documents.

- 11. Provide copies of all documents or communications between Texas Instruments and DuPont regarding the alleged defect in the subject switches. Organize the document copies in chronological order.**

TI is producing in chronological order documents reflecting communications with Dupont regarding the alleged defect in the subject switches, including correspondence, e-mails, and any notes of meetings and telephone calls. TI interprets this request to exclude general commercial communications, as well as litigation or mediation-related communications. Further, TI refers NHTSA to documents previously produced by TI in response to question 10 in connection with TI's September 2003 Letter.

- 12. Provide copies of all documents transmitted internally within Texas Instruments that relate to the alleged defect in the subject switches.**

TI is producing documents reflecting internal TI communications regarding the alleged defect in the subject switches. TI interprets this request to exclude litigation or mediation-related communications. Further, TI refers NHTSA to documents previously produced by TI in response to question 11 in connection with TI's September 2003 Letter, which concerned documents that relate to the durability of the switch there at issue.

- 13. Describe and decode all identifying markings used by Texas Instruments on the subject switches.**

The only identifying marks on the subject switches is the Ford part number, which is F3TA-9F924-CA, and a TI date code, which is a four digit Julian date code. That code is, on occasion, followed by an "a" or "b" to denote a change in the material lots (most frequently, the disc lots) used as of a given date. A document that describes the markings on TI switches is being produced.

- 14. Provide copies of all failure mode and effects analyses related to the subject switches.**

TI is producing its Design Failure Mode Analyses Reports ("DFMEA") and its Process Failure Mode Analyses Reports ("PFMEA") for the subject switches. TI interprets this request to exclude DFMEAs and PFMEAs prepared with respect to the component parts of the subject switch.

15. **State the number of each of the following that Texas Instruments has sold either as original equipment or replacement parts 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, month/year of sale (including the cut-off date for sales, if applicable), and the location to where the component was shipped:**
- a. **Subject components; and**
 - b. **Any kits that have been released, or developed, by Ford for use in service repairs to the subject component/assembly.**

Provide this information in Microsoft Access 2000, or a compatible format, entitled "REQUEST NUMBER FIFTEEN DATA." See Enclosure 1, Data Collection Disc, for a pre-formatted table designed for this submission.

(a) See Exhibit 4, which shows the number of 77PSL3-3 switches sold by TI as original equipment or replacement parts for the subject vehicles on a month by month basis for the period 2001-2005. This chart also shows the identity of the entity to which the switches were supplied during this period. Switches supplied to Ford's Tier One suppliers shown on Exhibit 4 were supplied for use as original equipment, while those supplied to Ford were generally intended for use as replacement equipment.

TI used a different computerized system to track inventory and sales prior to 2001. It would be quite burdensome to endeavor to retrieve monthly sales data and location shipped for that time period. Annual sales data for the 77PSL3-3 switch for the period prior to 2001 (and through 2002) is reported on Exhibit 1 to TI's September 2003 Letter. That Exhibit shows the number of switches supplied as original equipment and as replacement parts for each relevant year through 2002.²

The component name and part number were the same throughout the period, *i.e.*, 77PSL3-3. TI does not have any more specific information on how many switches were installed on each model Ford vehicle. With respect to cut-off dates, TI refers NHTSA to correspondence that is being produced by TI in response to question 10 of this letter.

² There is a small discrepancy in the 2001 annual figures reported on Exhibit 1 to the September 2003 Letter and those reported on Exhibit 4. TI believes that the discrepancy could be the consequence of different reporting systems, but will advise NHTSA if it uncovers any other basis for the discrepancy.

(b) TI has no responsive information concerning kits that have been released or developed by Ford for use in repairs to the subject switches.

16. For each sub-component of the subject switch, provide the supplier's name, address, and appropriate point of contact (name, title, and telephone number).

See Exhibit 3 attached to this letter.

17. Provide copies of any and all documents and/or communications prepared at any time by Texas Instruments and/or any contractor or representative working on behalf of Texas Instruments, which relates or may relate to Texas Instruments opinion, including the approval, or disapproval, of the application and utilization of the Texas Instruments pressure switch as used in any and all Ford vehicles. Include any and all background material used as a basis for these opinions. These documents may include but are not limited to any and all assessments, analyses, tests, test results, studies, surveys, simulations, investigations, inquiries and/or evaluations that were performed by or for Texas Instruments.

TI is producing responsive documents. Additional responsive documents may be found (a) in documents produced in response to question 10 of this letter and (b) among documents, including confidential documents, produced by TI in response to questions 7, 9 and 11 of the September 2003 letter. TI also refers NHTSA to TI's response to question 15 in TI's September 2003 Letter.

TI notes that as a supplier to Ford or its Tier One suppliers TI was not in a position to exercise "approval" or "disapproval" authority concerning either the application or utilization of the TI pressure switch in any or all Ford vehicles. In that regard, Ford's use, installation and placement of the switch in Ford's vehicles is not a matter within TI's control. Rather, Ford provided TI with the specifications for the switch and TI's role was to provide the switches that met those specifications, which it did.

18. Furnish Texas Instruments' assessment of the alleged defect in the subject switches, including:
- a. An assessment of the failure mechanism;
 - b. An assessment of the design factors of the subject switches that may influence the durability of the subject switches;
 - c. An assessment of the manufacturing factors that may influence the durability of the subject switches;
 - d. An assessment of the vehicle assembly factors that may influence the durability of the subject switches; and

- e. **An assessment of the use factors of the subject switches that may influence the durability of the subject switches.**

Please be as specific as possible in your answers and provide engineering explanations for how various factors effect the switch durability.

TI does not believe that there is any safety defect in the design or manufacture of the 77PSL3-3 switch. TI notes that vehicle fire incidence rates for the vehicles utilizing the subject switch are quite variable depending on vehicle model and model year, even though the same switch was provided for each vehicle during the period MY 1995 through MY 2002. TI is unable to explain why certain vehicles have higher fire incidence rates than do other vehicles, but the variability of these rates coupled with the consistency of the switches supplied to each type of vehicle suggests that switch design and manufacture do not explain the variability.

TI provided its detailed assessments responsive to this question in response to question number 15 in its September 2003 Letter and incorporates that assessment into this letter by reference. The failure mechanism, design, manufacturing, assembly and use factors described in the September 2003 Letter are the same with respect to the 77PSL3-3 switch as were described in that letter.

Finally, TI notes that it is continuing to be put on notice of fire claims concerning Ford vehicles equipped with a competitor's switch, which replaced the TI switch. One such claim, Bixler, involved a 2004 F-150 not equipped with the TI switch. Another claim, Casada, involved a 2000 F-150 covered by the subject recall, which vehicle allegedly experienced a fire after the recall repair was performed. If true, the vehicle did not contain a TI switch at the time of the fire. Copies of TI's litigation expert's photographs concerning these two fires are being produced for NHTSA's information. In yet another case, [REDACTED] MRU15W231 [REDACTED] TI was sued in a case involving a 2003 Expedition. The petition alleged that the vehicle caught fire due to TI's speed control deactivation switch, which was not in the vehicle. TI was later dismissed from this case. A copy of the petition filed in the [REDACTED] case, which was filed against TI by attorney Norman Jolly, is being produced by TI as Exhibit 5 to this letter.

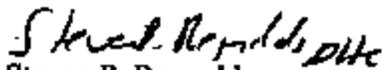
* * *

TI has worked diligently to prepare the above responses and gather the documents being produced. TI is prepared to discuss with NHTSA any of the above answers and to respond to

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any questions that the agency might have about these answers and any of the documents being produced.

Respectfully,


Steven P. Reynolds
Senior Counsel, Law Department
Texas Instruments, Inc.

cc: Mr. Bruce York