CHRYSLER

October 4, 2012

Mr. D. Scott Yon, Chief
Vehicle Integrity Division, NVS-214
U.S. Department of Transportation

National Highway Traffic Safety Administration (NHTSA)
Office of Defects Investigation (ODI)
Room W48-304
1200 New Jersey Avenue SE
Washington, D.C. 20590

Reference: NVS-212pco; EA12-001

Dear Mr. Yon:

Attached is Chrysler Group LLC's ("Chrysler") response to questions 1 through 10 of the referenced inquiry. Furthermore, Enclosure 6: Extended Service Contracts – Conf Bus Info, Enclosure 7: ASIC Circuits and Schematics – Conf Bus Info, and Enclosure 8: Inspection, Testing, Analysis - Conf Bus Info have also been submitted under separate cover to the NHTSA Chief Counsel's Office with a request for confidential treatment.

In performing the analysis and reaching conclusions, and by providing the information contained herein, Chrysler is not waiving its claim to attorney work product and attorney-client privileged communications.

Chrysler has conducted a reasonable and diligent search of its data repositories for complaints related to the alleged conditions. Chrysler's review of field data regarding the Peer vehicle populations of 2001 - 2004 MY AN, 2001 – 2003 MY DN, 2002 – 2003 MY DR, and 2003 – 2004 MY ZB demonstrates that there are no verifiable instances of inadvertent airbag deployments in these vehicles. As a result, Chrysler believes that all further investigations and assessments should focus on the 2002 - 2003 MY KJ and 2002 – 2004 WJ vehicle populations.

Chrysler has yet to determine the root cause of the inadvertent air bag deployments in the 2002 – 2003 MY KJ and the 2002 – 2004 MY WJ. Chrysler is continuing to investigate the causes of the inadvertent airbag deployments in the 2002 – 2003 MY KJ and 2002 – 2004 MY WJ. Chrysler and NHTSA have worked closely on this investigation over the past year, including participating in regular meetings and providing updates to NHTSA. Chrysler will continue to regularly report any future updates or new information as it becomes available.

Sincerely,

Paul Mantinaga

for David D. Dillon

Attachment and Enclosures

Preliminary Statement

On April 30, 2009 Chrysler LLC, the entity that manufactured and sold the vehicles that are the subject of this Information Request, filed a voluntary petition for relief under Chapter 11 of Title 11 of the United States Bankruptcy Code.

On June 10, 2009, Chrysler LLC sold substantially all of its assets to a newly formed company now known as Chrysler Group LLC. Pursuant to the sales transaction, Chrysler Group LLC assumed responsibility for safety recalls pursuant to the 49 U.S.C. Chapter 301 for vehicles that were manufactured and sold by Chrysler LLC prior to the June 10, 2009 asset sale.

On June 11, 2009, Chrysler LLC changed its name to Old Carco LLC. The assets of Old Carco LLC that were not purchased by Chrysler Group LLC, as well as the liabilities of Old Carco that were not assumed, remain under the jurisdiction of the United States Bankruptcy Court – Southern District of New York (*In re Old Carco LLC, et al.*, Case No. 09-50002).

Note: Unless indicated otherwise in the response to a question, this document contains information through August 10, 2012, the date the information request was received.

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1. **State within the body of the response letter a summary table, by make, model and model year, of the number of subject vehicles and peer vehicles Chrysler has manufactured for sale or lease in the United States. Separately, for each subject vehicle and each peer vehicle manufactured to date by Chrysler, state the following:**
   a. **Vehicle identification number (VIN);**
   b. **Make;**
   c. **Model;**
   d. **Model Year;**
   e. **Date of manufacture (in "yyyy/mm/dd" date format);**
   f. **Date warranty coverage commenced (in "yyyy/mm/dd" date format);**
   g. **The State in the United States where the vehicle was originally sold or leased (or delivered for sale or lease);**
   h. **Total number of air bags and seat belt pre-tensioners;**
   i. **If equipped with seat belt pre-tensioners;**
   j. **If equipped with side-impact air bags; and**
   k. **If equipped with side head curtain air bags.**

   Provide the detailed information in Microsoft Access 2007, or a compatible format, entitled "Q1_PRODDATA.accdb" and "Q1_PRODDATA_PEER.accdb" as needed. Multiple model vehicle (or peer vehicle) data can be provided in separate tables within a single database file providing that the overall file size does not exceed 1GB.

A1. The following summary table identifies the production data for all of the subject vehicles Chrysler has manufactured for sale or lease in the United States (US).

SUBJECT: MY/MAKE/MODEL/(BODY)	VOLUME
2002 Jeep Liberty (KJ)	208,710
2003 Jeep Liberty (KJ)	178,163

The following summary table identifies the production data for all of the peer vehicles Chrysler has manufactured for sale or lease in the United States (US). The peer vehicles were identified as having an Occupant Restraint Control Module (ORC) that contains squib ASIC(s) part number 150734-2* / LMB4009 (per 8/16/2012 clarification by Peter Ong).

PEER: MY/MAKE/MODEL/(BODY)	VOLUME
2002 Jeep Grand Cherokee (WJ)	212,994
2003 Jeep Grand Cherokee (WJ)	115,441
2004 Jeep Grand Cherokee (WJ)	320,076
2001 Dodge Dakota (AN84)	74,530
2002 Dodge Dakota (AN84)	68,439
2003 Dodge Dakota (AN84)	55,589
2004 Dodge Dakota (AN84)	62,824
2001 Dodge Durango (DN)	137,536

2002 Dodge Durango (DN)	112,409
2003 Dodge Durango (DN)	122,264
2002 Dodge Ram Pick-up (DR)	287,846
2003 Dodge Ram Pick-up (DR)	438,510
2003 Dodge Viper (ZB)	1739
2004 Dodge Viper (ZB)	2231

The values in the "Total" column (see Enclosure 1 files), which represent the total number of airbags and seat belt pre-tensioners in each vehicle, include values for the standard equipment front driver and passenger airbags.

The 2002-2003 KJ was only equipped with 1 seatbelt pre-tensioner, which was located at the driver's position.

The 2002-2003 KJ, 2001-2003 DN, and 2002-2003 DR side curtain airbags are not deploy commanded by the ORC, but instead are controlled by separate, stand-alone side impact modules.

The detailed response that lists the production data is provided in Enclosure 1 – Production Data, as Microsoft Access 2000 tables titled "PRODUCTION DATA (EA12-001) PEER" or "PRODUCTION DATA (EA12-001) SUBJECT".

2. **State the number of each of the following reports, received by Chrysler, or of which Chrysler is otherwise aware, which relate to, or may relate to, the alleged defect or problem condition in the subject vehicles and peer vehicles:**
   a. **Consumer complaints, including those from fleet operators;**
   b. **Field reports, including dealer field reports;**
   c. **Reports involving a fire, crash, injury, or fatality, based on claims against the manufacturer involving a death or injury, notices received by the manufacturer alleging or proving that a death or injury was caused by a possible defect or problem condition in a subject or peer vehicle, property damage claims, consumer complaints, or field reports;**
   d. **Property damage claims; and**
   e. **Third-party arbitration proceedings where Chrysler is or was a party to the arbitration; and**
   f. **Lawsuits, both pending and closed, in which Chrysler is or was a defendant or codefendant.**

For subparts "a" through "f" state within the body of the response letter a summary table containing the total number of each item (e.g., a. consumer complaints, b. field reports, etc.) separately. Multiple incidents involving the same vehicle are to be counted separately. Multiple reports of the same incident are also to be counted separately (i.e., a consumer complaint and a field report involving the same incident in which a crash occurred are to be counted as a crash report, a field report and a consumer complaint).

In addition, for items "c" through "f," provide a summary description of the alleged problem and causal and contributing factors and Chrysler's assessment of the problem, with a summary of the significant underlying facts and evidence. For items "e" and "f" identify the parties to the action, as well as the caption, court, docket number, and date on which the complaint or other document initiating the action was filed.

A2. The following tables summarize the reports identified by Chrysler that relate to, or may relate to, the alleged defect in the subject and peer vehicles. Chrysler has conducted a reasonable and diligent search of the normal repositories of such information.

Vehicle Inspection Field Reports are also included in the related documents associated with the CAIR Reports. See Enclosure 4 – Field Data (Legal) for summary descriptions relative to "c" through "f" above.

- No Fire, Crash, Property Damage, or Fatality claims are associated with Table 1 or 2.
- There was no 3rd party arbitration associated with Table 1 or 2.

TABLE 1 SUBJECT

Alleged Defect: Relates to or may relate to the unwanted or inadvertent deployment (deployment without a physical impact or crash and/or without a deployment command) of the air bags (frontal, side-impact, head curtains and seat belt pre-tensioner).					
MY/MODEL/BODY	CAIR	FIELD RPT	LEGAL	VINS TOTAL	VINS UNIQUE
2002 Jeep Liberty (KJ)	63	0	21	84	54
2003 Jeep Liberty (KJ)	82	3	34	119	72

- For Table 2, any DN/DR CAIRs, Field Reports, or Legal Claims are categorized as "Unsure", due to a lack of substantiating information.

TABLE 2 PEER

Alleged Defect: Relates to or may relate to the unwanted or inadvertent deployment (deployment without a physical impact or crash and/or without a deployment command) of the air bags (frontal, side-impact, head curtains and seat belt pre-tensioner).					
MY/MODEL/BODY	CAIR	FIELD RPT	LEGAL	VINS TOTAL	VINS UNIQUE
2002 Jeep Grand Cherokee (WJ)	44	2	12	58	34
2003 Jeep Grand Cherokee (WJ)	37	0	7	44	27
2004 Jeep Grand Cherokee (WJ)	9	0	3	12	8
2001,2,3,4 Dodge Dakota (AN84)	0	0	0	0	0
2001 Dodge Durango (DN)	1	1	1	3	1
2002 Dodge Durango (DN)	0	0	0	0	0
2003 Dodge Durango (DN)	1	0	0	1	1
2002 Dodge Ram Pick-up (DR)	4	0	2	6	2
2003 Dodge Ram Pick-up (DR)	0	0	0	0	0
2003,4 Dodge Viper (ZB)	0	0	0	0	0

3. **Separately, for each item (complaint, report, claim, notice, or matter) within the scope of your response to Request No. 2, state the following information:**
   a. **Chrysler's file number or other identifier used;**
   b. **The category of the item, as identified in Request No. 2 (i.e., a. consumer complaint, b. field report, f. lawsuits etc.);**
   c. **Vehicle owner or fleet name (and fleet contact person), address, and telephone number;**
   d. **Vehicle's VIN;**
   e. **Vehicle's make, model and model year;**
   f. **Vehicle's mileage at time of incident;**
   g. **Incident date (in "yyyy/mm/dd" date format);**
   h. **Report or claim date (in "yyyy/mm/dd" date format);**
   i. **Which air bag(s) deployed (driver and/or passenger air bag)?**
   j. **Whether the seat belt tensioner actuated (driver and/or passenger side);**
   k. **Whether the air bag warning light was illuminated prior to the air bag deployment;**
   l. **Whether the incident occurred at vehicle startup (within 10 sec of starting the vehicle), or if not, provide the following:**
      i) **Transmission gear shift position;**
      ii) **Vehicle speed at time of deployment;**
   m. **Whether there was a stored fault code in the ORC;**
   n. **Identify the specific ASIC chip that failed inside the ORC (i.e. U10 and/or U3 ASIC circuit, if known);**
   o. **Whether property damage is alleged;**
   p. **Number of alleged injuries, if any; and**
   q. **Number of alleged fatalities, if any; and**
   r. **Specify which air bag device(s) had deployed (i.e. Drv 1, Drv 2, Pass1, Pass2, Drv Side, Pass Side, Drv Curtain, Pass Curtain, Drv SB and/or Pass SB as applicable).**

   Provide this information in Microsoft Access 2007, or a compatible format, entitled "Q3_ORDATA.accdb." and "Q3_ORDATA_PEER.accdb" as needed. Multiple model vehicle (peer vehicle) data can be provided in separate tables within a single database file providing that the overall file size does not exceed 1GB.

A3. The detailed response that lists the customer complaints, field reports, legal claims, and lawsuits from Request No. 2, as requested in Items a. through r. is provided in Enclosure 3 – Request Number Two Data, in a Microsoft Access 2000 table titled "Q3_ORDATA (EA12-001)" or "Q3_ORDATA (EA12-001)_Peer".

4. **Produce copies of all documents related to each item within the scope of Request No. 2. Organize the documents separately by category (i.e., a. consumer complaints, b. field reports, f. lawsuits etc.) and describe the method Chrysler used for organizing the documents.**

A4. Copies of all documents within the scope of Request 2 are provided in Enclosure 4 – Field Data. The documents are organized by report type: CAIR, Field Report, or Legal Claim. For the customer complaints, the CAIR summaries are submitted in one .pdf file and the related documents are arranged in folders by CAIR number. The Field Reports are submitted in .pdf files arranged by VIN number. Additionally, Vehicle Inspection Field Reports are also included in the related documents associated with the CAIR Reports. The Legal Claims are arranged in folders by claimant name.

5. State within the body of the response letter a summary table, by model and model year, a total count for each of the following categories of claims, collectively, that have been paid by Chrysler to date that relate to, or may relate to, the alleged defect or problem condition in the subject vehicles and peer vehicles: warranty claims; extended warranty claims; claims for good will services including field, zone, or similar adjustments and reimbursements; or a customer satisfaction campaign.

Separately, for each such claim, state the following information:

a. Chrysler's claim/report number;
b. Vehicle owner or fleet name (and fleet contact person) and telephone number;
c. VIN;
d. Repair date (in "yyyy/mm/dd" date format);
e. Vehicle mileage at time of repair;
f. Whether the vehicle was involved in a crash or impact related to the claim;
g. Repairing dealer's or facility's name, telephone number, city and state or ZIP code;
h. Labor operation number;
i. Problem code;
j. Replacement part number(s) and description(s);
k. Concern stated by customer; and
l. Comment, if any, by dealer/technician relating to claim and/or repair.

Count as a separate claim each repair/incident assigned a separate claim/report number, even if a single vehicle is involved. Count as a single claim any duplicative claims assigned the same claim/report number.

A5. This table includes all paid claims for all subject component part replacements related to the failure code conditions listed in response to Question #6. These claims are not all necessarily related to the alleged defects as there are other reasons for replacing the Air Bag / Occupant Restraint Control Module, aside from the alleged defects. For instance, in addition to supporting the driver and passenger frontal airbag circuits, the subject component also may support functions for driver & passenger side airbag curtains, driver and passenger seat mounted side airbags, seat belt pre-tensioners, and a passenger occupant classification system. Therefore, the number of warranty claims shown here may be artificially high and unrelated to the alleged defect. Thus, Chrysler has not drawn conclusions regarding trends for the alleged defects based on warranty data alone. The warranty claims are itemized by labor operation codes below:

MY / Model / Body	ORC Claims	LOP Code
2002 Jeep Liberty (KJ)	672	08450901
2003 Jeep Liberty (KJ)	356	08450901
2002 Jeep Grand Cherokee (WJ)	792	08450901
2003 Jeep Grand Cherokee (WJ)	370	08450901
2004 Jeep Grand Cherokee (WJ)	509	08450901
2001 Dodge Dakota (AN84)	261	08450901
2002 Dodge Dakota (AN84)	132	08450901
2003 Dodge Dakota (AN84)	76	08450901
2004 Dodge Dakota (AN84)	61	08450901
2001 Dodge Durango (DN)	149	08450901
2002 Dodge Durango (DN)	112	08450901
2003 Dodge Durango (DN)	114	08450901
2002 Dodge Ram Pick-up (DR)	66	08450901
2003 Dodge Ram Pick-up (DR)	113	08450901
2003 Dodge Viper (ZB)	7	08450901
2004 Dodge Viper (ZB)	7	08450901

Labor Operation (LOP) Code	Description
08450901 – Module, Air Bag/Occupant Restraint Control - Replace	

The detailed response that lists the warranty claims is provided in Enclosure 5 - Warranty Data, in a Microsoft Access 2000 table titled "Q5_WRNTYDATA (EA12-001)" or "Q5_WRNTYDATA (EA12-001)_Peer".

6. **Describe in detail the search criteria used by Chrysler to identify the claims identified in response to Request No. 5, including the labor operations, problem codes, part numbers and any other pertinent parameters used. Provide a list of all labor operations, labor operation descriptions, problem codes, and problem code descriptions applicable to the alleged defect or problem condition in the subject vehicles and peer vehicles. State, by make and model year, the terms of the new vehicle warranty coverage offered by Chrysler on the subject vehicles and peer vehicles (i.e., the number of months and mileage for which coverage is provided and the vehicle systems that are covered). Describe any extended warranty coverage option(s) that Chrysler offered for the subject vehicles and peer vehicles and state by option, model, and model year, the number of vehicles that are covered under each such extended warranty.**

A6. The search criteria used by Chrysler to identify claims reported in the response to Request No. 5 can be found in the charts below:

Failure Code	Code Descriptions
11	Broken or Cracked
58	Circuit Open
61	Intermittent Operation
SE	Shortage Part
UC	Uncodeable

Labor Operation (LOP) Code
08450901 – Module, Air Bag/Occupant Restraint Control - Replace

The standard warranty offered on the subject vehicles was 36 months / 36,000 miles. There was no extended warranty coverage for the subject components, but there were service contract coverage options available for purchase through Chrysler's authorized dealers which extend coverage on the subject components. Beyond standard warranty coverage, Module, Occupant Restraint Control claims (LOP 08450901) are covered by any "Maximum Care" option or the "Certified Pre-Own Vehicle Maximum Care" (CPOV) option. The Maximum Care option coverage choices range from 36 months / 45,000 miles to lifetime unlimited mileage and the CPOV option covers claims for the subject components for the 1st 3 months / 3,000 miles.

The total number of subject vehicles that are or have been covered by one of the service contract plans is listed in Enclosure 6 – Extended Service Contracts Conf Bus Info which will be submitted under separate cover to the NHTSA Chief Counsel's Office with a request for confidential treatment.

Any service contract claims for the applicable labor operation codes are included in the warranty data being provided in response to Question 5. Chrysler notes that owners may also have the opportunity to purchase additional service contract coverage through other third-party providers, but Chrysler does not have access to that data.

7. **Describe the similarities and differences between the subject vehicle's ORC and the peer vehicle's ORC including air bag functionality (frontal, side-impact, head curtains and seat belt pre-tensioner); how the air bag squib firing circuits are assigned for each ASIC circuitry; number of ASIC circuits used for firing the air bags (frontal, side-impact, head curtains and seat belt pre-tensioner), and the part number designation/identification/revisions level of the ASIC circuit(s). Provide also a schematic of the ORC module and a pictorial diagram and/or photograph showing the relative location of the ASIC(s) in reference to the ORC module circuitry.**

A7. A summary table, identifying the similarities and differences between the subject vehicle's ORC and the peer vehicle's ORC, including air bag functionality, how the air bag squib firing circuits are assigned for each ASIC, number of ASIC circuits used for firing the air bags, and the part number designation/identification/revisions level of the ASIC circuit(s), is included in Enclosure 7 - ASIC Circuits and Schematics – Conf Bus Info.

Photographs and schematics for the subject and peer vehicle ORC modules, showing the relative location of the ASIC(s) in reference to the ORC module circuitry, are included in Enclosure 7 - PCB Photos ASIC Locations, PCB Photos and ASIC Locations.pdf.

8. Provide a description of any inspection, testing, examination, and/or failure/forensic analysis of any subject vehicle and/or part of any subject component (include any model peer vehicles that has more than 10 unique problem condition incidents) conducted by Chrysler as part of its assessment of the alleged defect (or problem condition).

A8. The requested assessments are listed below and for each assessment the appropriate enclosures are referenced as applicable.

Assessment 1: ORC Module Root Cause Analysis

Start Date	End Date	Engineering Group Responsible
3/3/2005	Pending	Chrysler Product Investigations & Recall Administration Chrysler E/E Systems Engineering TRW Engineering

ORC Module R/C Analysis Objective:

Visual examination of ORC modules removed from CAIR vehicles, to retrieve events and/or crash records from PTM (Plant Test Mode for TRW diagnostics) Screen and EEPROM (Electrically Erasable Programmable Read- Only Memory). Determine if customer's allegation of inadvertent airbag deployment (IAD) was valid. Look for similarities and/or contrasts in either physical appearance or electrical performance. Determine cause of IAD events.

ORC Module R/C Analysis Results:

- Review of ORC modules retrieved from CAIR vehicles where an inadvertent airbag deployment was alleged. External examinations did not reveal damage or corrosion to case or connector pins. Internal examination showed that one of the two squib Application Specific Integrated Circuits (ASICs) attached to the printed circuit board showed evidence of Electrical Over Stress (EOS). ORC's were provided to the module supplier (TRW) for analysis and where module data was available; no evidence of crash records was found. Product change levels of the ORCs retrieved from CAIR complaint vehicles ranged from AG to AI change levels. See Enclosure 8 - Inspection, Testing, Analysis - Conf Bus Info, KJ ASIC Study.

- Visually inspect printed circuit boards (PCBs) for any visible differences (3W[redacted], 3W[redacted], 3W[redacted], ME1361E0008, ME0740H0015). There were no visible identifiable differences in componentry, construction or layout.
- Review of returned modules for pattern or concentrations of damage to the ASIC. There was a noticeable EOS concentration around pins 5/6 and 9/10. These pins are identified as VFire and VDiag. See Enclosure 8 - Inspection, Testing, Analysis - Conf Bus Info, KJ EOS Concentration Diagram.
- Purchase ORC modules from salvage yards from vehicles that were built prior to March 19, 2003 (hereafter described as Legacy ORCs). Review for differences compared to known IAD field modules. No visual difference observed between the Legacy or IAD modules.
- Component testing to specification and to voltage transients much great than the industry accepted standards, using Legacy modules and repaired IAD modules. Test per CS 11979 for: Conducted transient immunity, Load Dump, Voltage Dips, Voltage Drops, Voltage Ripple, Reset Behavior at Voltage Drop, Defective Regulation, Coupling Clamp A/B, and Direct Capacitor Coupling. No issues were detected. See Enclosure 8 - Inspection, Testing, Analysis - Conf Bus Info, KJ ORC - Transient Testing Summary.pdf.
- Component testing for ASIC latch-up using Legacy modules and repaired IAD modules. TRW attempted to induce a latch-up condition in the ASIC to see if the failure mode is similar to IAD field returns. It was determined that true latch-up testing could not be conducted. The testing was renamed "Negative Voltage Testing". No EOS conditions were able to be created during this testing. See Enclosure 8 - Inspection, Testing, Analysis - Conf Bus Info, 20120328 KJ Negative Voltage Testing Update.
- Component noise induction testing using Legacy modules and repaired IAD modules. TRW used an injection probe to induce noise on the squib lines. The testing was able to create EOS conditions on ASICs that visually had similarities to the ASICs from IAD ORC modules. TRW's results confirmed Chrysler's testing that was performed at the vehicle level (see Vehicle Level R/C Analysis, Vehicle Pulse Injection Testing). See Enclosure 8 - Inspection, Testing, Analysis - Conf Bus Info, Ind Noise DOE Summary Update.pdf and 20120314_Induction Noise Test Update.pdf.
- Component Equivalent Series Resistance (ESR) characterization, using all returned IAD modules, modules from salvage or customer vehicles and service modules from Mopar, to identify differences in measurements (as discussed and provided to NHTSA during April 12, 2012 meeting). To date Chrysler has characterized 92 KJ ORCs and has classified them as either Deployed, Clean, or Legacy. Deployed modules were retrieved from IAD vehicles. Legacy and Clean modules came from customer vehicles, salvage yards, or service parts. Deployed and Legacy modules exhibit the same ESR, which is consistently different (less robust) than the ESR of Clean or Service modules. The findings related to this testing have been the main driver in the solution being proposed by Chrysler. See Enclosure 8 - Inspection, Testing, Analysis - Conf Bus Info, KJ ESR Concentration Diagram.pdf.
- Component ESR testing of ORC modules from customer vehicles with vehicle build dates between February 15, 2003 and March 3, 2003. This study is intended to increase the population sample size in an area of vehicle builds where the IAD events no longer exist. The vehicles chosen contain modules that were built either on or near the build

dates of IAD modules. The data will help Chrysler determine if capacitor construction or build lots were mixed. The study is still being conducted and the results are pending. Note: Based upon information that was provided by TRW on October 3, 2012, the scope of this assessment will likely be changing or expanded.

- TRW performed a Fault Tree Analysis (FTA) for the subject vehicle ORC module. The FTA summary reveals, based on field information, that the plausible cause of the IAD events could be a combination of vehicle overstress condition (noise on squib lines) and possible silicon inconsistencies resulting from processing common cause variation (ILD layer near Vdiag or parasitic diode junction near Vdiag) and could cause voltage/current potential on the Squib ASIC substrate. See Enclosure 8 - Inspection, Testing, Analysis - Conf Bus Info, FTA_Undesirable Deployment.pdf.

ORC Module R/C Analysis Summary:

- Chrysler has observed that in all confirmed instances of IAD the subject KJ (and WJ peer vehicles) one of the two squib ASICs within the ORC has experienced an EOS condition. This EOS condition of yet undetermined cause occurs during or immediately prior to the ASIC allowing firing voltage to escape to the squibs that are controlled by that particular ASIC.
- ORC modules, retrieved from IAD event vehicles, have consistently exhibited diminished ESR performance when compared to service or clean modules. This diminished ESR performance could affect the capacitor's ability to protect the ASIC from outside transients. Previously, Chrysler had been focusing on capacitor construction differences (standard versus floating) to account for these differences in ESR performance and how those differences affect ESR performance. Based upon an October 3, 2012 meeting with TRW, it now appears that a capacitor material change from Precious Metal Electrodes (PME) to Base Metal Electrodes (BME) may be responsible for the ESR differences Chrysler has been observing.
- Lab created EOS conditions on ASICs within Legacy modules may visually appear similar to EOS field returns; however, the inputs required to create the EOS in the lab also create an EOS condition in Service or Clean modules, which to date have never been found to be susceptible to EOS in the field.

Assessment 2: ORC Component Root Cause Analysis

Start Date	End Date	Engineering Group Responsible
1/2/2012	Pending	Chrysler Product Investigations & Recall Administration Chrysler E/E Systems Engineering TRW Engineering

ORC Component R/C Analysis Objective:
Examination of ORC module ASICs and capacitors, removed from CAIR vehicle modules, to determine cause of IAD events.

ORC Component R/C Analysis Results:

- ASIC Analysis: To determine if the ASICs from IAD modules have similar failure modes, EOS ASICs were provided to Texas Instruments (TI) for analysis. Additionally, to determine if lab created EOS events are similar to the EOS events exhibited in the IAD modules. To date 3 reports have been provided by TI, with 6 reports still in process. At this time the reports indicate similarities in internal damage to the ASICs, when comparing IAD module EOS ASICs to lab created EOS ASICs. See Enclosure 8 - Inspection, Testing, Analysis - Conf Bus Info, 2012060008 Final Report SN1x.pdf, 2012170015 Initial Report.pdf, 2012130030 Initial Reportx.pdf, and 2012190024 Johnson U3 AEN 6540.pdf.
- ASIC Analysis: To determine if undamaged sister ASICs from IAD modules exhibit any signs of having been damaged or weakened prior to or at the time of the vehicle's IAD event, sister ASICs were provided to Texas Instruments (TI) for analysis. The reports indicate that there was no identifiable damage to the sister ASICs. See Enclosure 8 - Inspection, Testing, Analysis - Conf Bus Info, 2012060008 Final Report - Sister ASIC.pdf.
- Capacitor testing (Coilcraft): Using capacitors from Legacy modules, IAD modules, and Service modules, determine if the capacitors degrade over time (Life Testing). The testing showed that no degradation of the capacitors occurred during the life testing. See Enclosure 8 - Inspection, Testing, Analysis - Conf Bus Info, CoilCraft Chrysler Capacitor Testing.pdf.
- Capacitor Analysis (Chrysler Materials Lab): Using capacitors from IAD and Service modules, determine the construction differences of capacitors protecting the module on the squib lines. The Chrysler material lab was able to confirm differences (indicated by ESR testing) in the electrode construction of the squib capacitors. Please refer to information and photographs reviewed with NHTSA on May 30, 2012.
- Capacitor Analysis (TRW): Using capacitors from Legacy modules, IAD modules, and Service modules, determine construction and/or performance differences of capacitors protecting the module on the squib lines. See Enclosure 8 - Inspection, Testing, Analysis - Conf Bus Info, Kemet Cap Analysis Summary- KJ.

ORC Component R/C Analysis Summary:

- EOS ASICs from IAD event vehicles all exhibit similar internal damage.
- Forensic evidence has shown that the EOS damage to the ASICs is likely the result of a single event rather than incremental damage occurring over time that ultimately results in the EOS condition.
- No deterioration over time or reduced performance of the squib capacitors was observed during life cycle testing.
- On October 3, 2012, TRW first revealed to Chrysler that a previously undisclosed material change occurred within the capacitors that protect the ASICs in the KJ and WJ ORC modules. This material change, which replaced the precious metal electrode (PME) material with base metal electrode (BME) material, occurred at Kemet in May of 2002 and was implemented in vehicle production around October 2002. TRW also revealed that the change from PME to BME would cause a shift in capacitor ESR performance. Chrysler had previously been focusing on capacitor construction differences (standard versus floating) as a cause for shifts in ESR performance. It is now likely that the capacitor change from PME to BME is responsible for the ESR differences. New efforts are underway to determine if there is a correlation between the material change and IAD events.

Assessment 3: Vehicle Level Root Cause Analysis

Start Date	End Date	Engineering Group Responsible
11/1/2011	Pending	Chrysler Product Investigations & Recall Administration Chrysler E/E Systems Engineering

Vehicle Level R/C Analysis Objective:
Testing to determine cause of IAD event in subject and peer vehicles through design review and vehicle level testing.

Vehicle Level R/C Analysis Results:

- Vehicle level change notice (CN) analysis was performed to assist with the explanation of why there was an absence of IAD events in the subject vehicles after the vehicle build date of March 19, 2003. There were no obvious changes to any system or subsystem that would cause a negative impact on the vehicle performance. Additionally, none of the reviewed CNs timing coincides with the time period in question to explain the change in trend. Additionally, vehicle level testing correlates with the CN data and there have been no conducted transients observed on the vehicle that exceed the vehicle specifications.
- Vehicle level testing, using repurchased IAD event vehicles, to CS 11980 Requirements for Vehicle Conducted Transient Analysis, Radiated Immunity (to specification and to levels exceeding the CS 11980 requirements, up to 200V/m), Load Dump, Vehicle On Board Transmitters, Vehicle ESD, and to levels exceeding the CS 11980 requirements for Radiated Immunity of 150 V/m (test up to 200V/m). Vehicles 3W[redacted] and 3W[redacted] met the requirements. See Enclosure 8 - Inspection, Testing, Analysis - Conf Bus Info, 2002 KJ V12067.pdf and 2002 KJ V12032.pdf.
- Vehicle level instrumented road testing: Instrument a vehicle on all squib and ignition lines to capture any voltage transient that occur during normal driving conditions.
  - Potential noise sources on vehicle (allowable voltage amplitude at source, e.g. motors, solenoids, actuators, etc.). No transients were recorded on the tested vehicles that exceed the Chrysler limits of +/-80V.
  - Measurements taken at ORC ignition and ORC squib lines while driving and/or actuating potential vehicle noise sources. No transients were recorded on the tested vehicles that exceeded +/-35V (ignition lines) or +/-4V (squib lines).
- Vehicle level non-instrumented road testing: Drive repurchased IAD vehicles, equipped with IAD (EOS ASIC replaced) or Legacy modules, with the intent of recreating the sequence of events that leads up to an IAD event. Vehicles 3W[redacted] 3W[redacted], and 3W[redacted] have been driven by knowledgeable Electromagnetic Compatibility (EMC) staff to document observations, none of which to date have included a reproduced IAD event. Testing is on-going; approximately 7,500 miles have been logged to date.
- Vehicle level pulse injection testing (3W[redacted]): Inject a pulse on the ORC squib lines (regardless of voltage) in order to re-create an IAD field event. A frequency at an extreme and unrealistic voltage (60x higher than any seen on a test vehicle), capacitively injected on the squib lines, was shown to damage the ASIC of both Legacy and Service ORCs. While TI has analyzed the damaged ASIC and has agreed that the damage is similar to IAD field

samples, it is recognized that the extreme and unrealistic voltage required to generate the EOS damage also causes Service modules to exhibit the EOS signature. This is in stark contrast to any of the IAD field returns to date. Chrysler has never received a service module that has experienced an IAD event. TRW ORC module testing (see TRW's Component Noise Injection Testing under ORC Module R/C Analysis above) supports the results of these vehicle level tests.

- Vehicle Environmental Testing: Deployed vehicles, equipped with repaired IAD modules or Legacy modules parts from salvage yards, were placed into climatic chambers. The vehicles were soaked for 18hrs at +80F or greater and +85%H, then operated on 2hr on / 2hr off cycle with sub-systems operating to simulate conditions reported by customers, with the intent of recreating the sequence of events that leads up to an IAD event. Vehicles 3V[redacted] and 3V[redacted] were utilized and no issues were detected. However, the recent information regarding the change from PME to BME in the capacitor may cause us to revisit this line of testing, as the field data suggests that IAD events occur more frequently in warmer and/or more humid climates.
- A recently purchased 2003 WJ peer vehicle is currently undergoing the same vehicle level testing as indicated above.

Vehicle Level R/C Analysis Summary:

- There are no vehicle changes that coincide with the history of IAD events.
- None of the vehicle level testing that has been performed to date has been able to recreate an IAD event.
- None of the vehicle level testing has produced any vehicle transients that exceed Chrysler's specifications or may be implicated in the IAD events.
- The recent information regarding the change from PME to BME in the capacitor may cause us to revisit some aspects of the vehicle level testing that has been performed to date.

9. Provide copies of all documents (including e-mails) reflecting any communication(s) (including the exchange of any information, reports, or analyses) between Chrysler and TRW Automotive pertaining to the alleged defect, including, but not limited to, any communications(s) concerning a problem or potential problem with the subject component.

A9. Chrysler has searched its records kept in the ordinary course of business for communications -- including emails, information exchanges, reports and analysis – that were sent to or received by TRW relating to the alleged defect in the subject vehicles. Some records may be no longer available due to the applicable document retention requirements of Chrysler.

Because most of these communications contain the comingled confidential business information of both TRW and Chrysler, Chrysler is currently preparing these communications for production to the agency under a separate cover with a request for confidential treatment from both TRW and Chrysler. These communications, which are mostly emails with attachments, have been duplicated and will be provided in a text searchable .pdf format. Chrysler will also provide an index of these communications that

contains a file identifier, the file name and, where possible, identifies the author and recipients. Emails and their attachments will remain unitized.

10. Furnish Chrysler's assessment of the alleged defect or problem condition in the subject vehicle and peer vehicle, 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;
e. Any significant similarities and or differences between the ORC module used in the subject versus the peer vehicles, and their significance;
f. What warnings (both visually and audibly), if any, the operator would have that the alleged defect or problem condition was occurring or about to occur, or that the subject component was malfunctioning (does the air bag light illuminate intermittently or in a constant ON mode);
g. The reports included with this inquiry.

A10. Assessment

Chrysler's investigation is continuing. As noted above in response to question 8, there are pending investigative studies, the results of which will be provided to NHTSA upon completion.

Chrysler has made the following observations based upon testing and the available customer complaints and field data:

- Chrysler's review of field data regarding the peer vehicle populations of 2001 - 2004 MY AN, 2001 – 2003 MY DN, 2002 – 2003 MY DR, and 2003 – 2004 MY ZB demonstrates that there are no verifiable instances of IAD events. As a result, Chrysler believes that all further investigations and assessments should focus on the 2002 - 2003 MY KJ and 2002 – 2004 WJ vehicle populations.
- Chrysler's review of field data regarding the peer vehicle population of 2002 - 2004 MY WJ demonstrates there are IAD events occurring in some vehicles that exhibit similarities when compared to the 2002 – 2003 KJ subject vehicle population IAD events.
- Chrysler's review of field data for the 2002 - 2003 MY KJ subject vehicle population and the 2002 – 2004 WJ peer vehicle population indicates that approximately 50% of the drivers observed an air bag warning lamp or an audible chime, closely preceding the IAD event in their vehicle.
- For the 2002 - 2003 MY KJ subject vehicle population and the 2002 – 2004 WJ peer vehicle population, Chrysler has yet to determine the definitive root cause of the IAD incidents involving frontal air bag(s), side curtain air bags (WJ only) or seat belt pre-tensioners (without crash/impact).
- Chrysler has observed, in all confirmed instances of IAD in the KJ and WJ vehicles, that one of the two squib ASICs within the ORC has experienced an EOS condition. This EOS condition of undetermined cause occurs during or immediately prior to the ASIC allowing firing voltage to escape, to the squibs that are controlled by that particular ASIC.

- Chrysler's review of the ORC schematics for the 2002 - 2003 MY KJ and 2002 – 2004 WJ vehicles indicates similar levels of capacitor protection on all input / output lines leading to the firing ASICs. The frontal airbags of both of these vehicles are dual stage. Chrysler has noted that the safing sensor is located at the microprocessor in both of these ORCs. This is in contrast to the safing sensor being located at the ASIC for peer vehicles AN, DN, and DR, all of which have single stage front airbags. The 2003 – 2004 ZB (Viper) peer vehicles are equipped with dual stage airbags and share the same safing sensor location as the WJ peer vehicles. However, there are no known IAD events associated with these low-volume, specialty vehicles.
- Vehicle and component level testing has shown:
    - There are no vehicle changes that coincide with the history of IAD events.
    - Chrysler vehicle level testing could not recreate an IAD event.
    - Chrysler vehicle level testing showed no transients exceeding specifications.
    - EOS ASICs from IAD event vehicles all exhibit similar internal damage.
    - EOS damage to the ASICs is likely the result of a single, onetime event.
    - Squib capacitors do not experience reduced performance over time.
    - IAD ORC modules have consistently exhibited diminished ESR performance. Non-Legacy modules do not exhibit diminished ESR performance.
    - The cause of the diminished ESR performance in the Legacy modules, once believed to be attributed to a capacitor construction design, may now be a result of the PME to BME capacitor material change, noted in Assessments 1, 2 and 3.
- The October 3, 2012 information from TRW about the PME to BME capacitor material change requires Chrysler to reevaluate its current assessments, as well as include possible future assessments to understand how the change from PME to BME correlates to the KJ and WJ IAD events and their associated trend lines.
- There were no fire, property damage or fatality claims associated with IAD events in KJ and WJ vehicles. The injuries reported were of a superficial, minor nature and an IAD event did not cause a crash. This is likely because of the IAD events in the subject vehicles almost 54% of the deployments resulted in only 20% driver air bag power (i.e., Stage 2 only). The inadvertent deployment of the pretensioner, in these Stage 2 only deployments, simply removes slack in the restraint and is not an injury-causing mechanism. While 100% of WJ IAD events are full deployments, either the side curtain airbags or the frontal airbags will deploy, but never both.

In summary, Chrysler has yet to determine the root cause of the inadvertent air bag deployments in the 2002 – 2003 MY KJ and the 2002 – 2004 MY WJ. Chrysler is continuing to investigate the causes of the inadvertent airbag deployments in the 2002 – 2003 MY KJ and 2002 – 2004 MY WJ. Chrysler and NHTSA have worked closely on this investigation over the past year, including participating in regular meetings and providing updates to NHTSA. Chrysler will continue to regularly report any future updates or new information as it becomes available.