FACT

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August 3, 2011

Grieco, Oates& DeFilippo, LLC
414 Eagle Rock Avenue, Suite 200
West Orange, New Jersey 07052

Attention: Angel M. DeFilippo

Re: [redacted] **v. DaimlerChrysler Corporation**

Dear Ms. DeFilippo,

I have studied the crashworthiness of the 1996 Jeep Grand Cherokee in which [redacted] was fatally injured. I inspected the remains of the vehicle on April 2, 2009. I also reviewed the preliminary report of Donald Phillips who has performed an accident reconstruction, the New Jersey Police crash investigation report, and photographs made at the accident scene. Based on my inspection, research and experience I have formed opinions regarding the safety performance of the subject vehicle in this crash. Prior to stating my opinions, here is a brief outline of my education, training and experience with crashworthiness, fuel system design integrity and vehicle fires:

I. Background, Qualifications, and Methodology

I received a Bachelor's degree in Mechanical Engineering from General Motors' Institute (GMI, now Kettering University) in 1981. At GMI I was enrolled in the "Automotive Option" curriculum.

My curriculum vita, which is Attachment I, shows my background in automotive design, design analysis and development engineering, and my experience with fire related product recalls. I also have experience with the product creation process within large organizations.

II. Design Experience

A. I was responsible for all vehicle design while working as the Chief Engineer at Saleen. Two designs were specifically for enhancing fuel system safety and reducing possibility of fire. I designed an exhaust system with a particular feature to provide enhanced fuel system safety and integrity. This exhaust system had a feature that allowed it to disconnect from its' mounting system and drop down and below the fuel tank. This reduced the possibility that the exhaust system could intrude on an exposed area of the

fuel tank. I also designed and implemented a feature to prevent an underhood fuel hose from being damaged by a hot EGR tube.

B. I was responsible for all vehicle design while working as the Chief Program Engineer for the Ford GT. In this role I defined the design concept and the packaging strategy for the fuel tank. Primary consideration was given to protection of the fuel tank in impacts. I also defined the concept for the fuel hose and filler pipe routing.

III. Development Experience

A. During my assignment as the vehicle development engineer for the Dodge Viper I was involved in the development of improvements to resolve 3 different issues that related to fires.

B. I investigated an underhood fire occurrence while I was working as a vehicle development engineer for Chrysler at the Chrysler/Shelby Performance Center.

C. I participated in an investigation of an underhood fire situation while I was employed as the Executive Director of Engineering at McLaren Automotive Ltd. This investigation lead to a voluntary product recall for an alternator electrical issue. I was also responsible for engineers that investigated fuel leaks that occurred on production vehicles. These issues were traced to quality control at a supplier and resulted in corrective action at that supplier.

D. I investigated numerous fire issues while I was the Chief Engineer at Saleen Inc. The resolution of these investigations resulted in my ordering 2 voluntary product recalls.

IV. Assignment

I was requested to determine if there was a product defect related to the 1996 Jeep Grand Cherokee that was the cause of the fire which resulted in the death of [redacted]

V. Investigation, Materials Reviewed:

New Jersey Police crash investigation report
Photos from April 2 2009
Accident reconstruction preliminary report of Donald Phillips
Photographs taken by Donald Phillips
A copy of the newspaper article regarding the collision
41 Photographs taken by the State Police of the scene of the collision
A Chrysler memo dated July 22, 1996 regarding plastic fuel tanks and placement of fuel tanks.
A Chrysler memo dated August 24, 1978 regarding Fuel System Design – Chrysler Passenger Cars and Trucks.
Parsippany Fire Department incident report of February 24, 2007

Witness statement of April 30, 2007 of Peter Moodie taken by the insurance company of Defendant Natalie Rawls.
Deposition of Defendant Natalie Rawls
Hannemann Inspection Photos from April 2nd, 2009
Discovery materials from Chrysler Group LLC
Robert Banta Report
Paul Taylor report from Jarmon case
Nicholas Durisek Report
Jeep Frame drawings from Mitchell International
Paul Sheridan report
Crash test – Federal Outdoor Impact Laboratory
Crash test – Center for Auto Safety, test number TR-P31015-01-NC
Exhibits from Estes deposition
William J. Meyer P.E. Report
Deposition of Francois Castaing June 14, 2011
Deposition of Bernard Robertson June 15, 2011
Deposition of Owen Viergutz June 15, 2011
Donald R. Phillips, P.E. Supplemental Report July 25, 2011

VI. Background

The accident occurred on Saturday February 24, 2007 in Parsippany, New Jersey. [redacted] was driving a 1996 Jeep Grand Cherokee southbound on I-287. [redacted] suddenly slowed dramatically, and [redacted] slowed accordingly. She was then struck by [redacted] who had been following [redacted] and failed to observe the slow vehicles striking the rear of [redacted] Jeep Grand Cherokee. The collision propelled the Jeep into [redacted] Subaru. The Jeep immediately caught fire. The door of the Jeep that [redacted] apparently tried to use for egress was jammed shut. The medical examiner concluded that [redacted] died of smoke inhalation and thermal injuries.

VII. Vehicle Inspection

I inspected the subject vehicle on April 2nd 2009 in Boonton, New Jersey.

VIII. Analysis and Discussion

1) Fuel Tank. The fuel tank was in a poor location and did not have sufficient protection from this foreseeable type of impact. Jeep had available an optional "Up Country Group" that added, among other items, a skidplate that provides protection to the fuel tank. There is also an optional "Trailer Tow Group" that added a trailer hitch which would also provide impact protection to the fuel tank.

2) Vehicle Structure. There is a large opening in the floorpan near the left rear wheelhouse. This opening is a structural failure that would have allowed fire from the burning gasoline to easily enter the passenger compartment. The passenger door was jammed and was not able to be opened during my inspection. This appears to be the door that [redacted] was attempting to use to egress the vehicle. This is most likely, as the fire was most probably more severe close to the left door due to the massive opening in the structure in this area allowing fire through. Had this opening not allowed fire to enter

the passenger compartment then it is most likely that [redacted] would have used the more logical driver's side door to successfully exit the vehicle as that door was not jammed.

3) Rear under run. Chrysler should have given more considerations for this foreseeable type of accident with better under run protection. This vehicle was designed with off road considerations as primary factors, in this particular case, departure angle. This resulted in a relatively high mounted bumper. With the high mounted bumper the fuel tank was more exposed to rear impacts than in vehicles designed primarily for on road usage. Chrysler should have used every options available (skidpans and trailer hitches) that would have provided more protection to the fuel tank as standard equipment.

4) Egress: It is important that occupant egress is maintained in all crash situations. In this case the passenger door was jammed shut. Had it not been jammed, [redacted] would have been able to exit the vehicle away from the fire.

5) Impact Severity: All other persons involved in this accident were either not injured or slightly injured and fully recovered. This indicates that the overall accident was not severe enough to cause death and injury without the fire. It is recognized and accepted that an impact of a magnitude to cause a fire should also be severe enough to cause life threatening orthopedic injuries. This principle was set forth at General Motors. The presentation that defines the principle is included as a reference document to this report. These types of injures were not present for either [redacted] or any others involved. Susan's death was caused by the fire alone.

6) DaimlerChrysler crash test program strategy: DaimlerChrysler's design safety strategy was to design only to the minimum requirements of the federal safety standards for fuel system safety rather than to enhance safety using state of the art design. By contrast, competing companies utilized additional tests that ensure enhanced safety of the vehicle. For example, Ford runs a side impact test with the moving barrier aligned with the fuel filler to provide a "worst case" scenario. General Motors runs 50 mph car-to-car tests for fuel system safety. These typically impact the rear and filler neck areas. The absence of these types of tests prevented DaimlerChrysler from identifying potential problems related to the manufacture and design of the 1996 Jeep Grand Cherokee.

In vehicle models where the vehicle has many configurations and options, there is engineering judgment applied to select "worst case" for testing. Ideally all configurations and options should be tested. In some cases where there are many configurations (such as Pick Ups) this is not practical. Good engineering practice would use the "worst case" configuration as the focus for testing. Consideration must also be given to the vehicle configuration with "standard" equipment and with optional equipment. A vehicle should meet all FMVSS standards with the "standard" equipment. Engineering judgment could then be applied to decisions about options.

7) FMVSS 301 certification tests (1993-1996 model years): It does not appear that the Morris-Kline vehicle as sold was certified for FMVSS 301. For the 1993 – 1996 Jeep Grand Cherokee there were 10 rear impact tests that were run by Chrysler between 10/11/1988 and 5/4/1992. The last 2 of these tests were both considered as certification tests for FMVSS 301.

a. Test 4472 was a 30 mph rear moving barrier impact test. The test vehicle in this case was equipped with a trailer hitch and a full size spare. Even though this test

is considered a pass, the trailer hitch contacts the fuel tank, an event that Chrysler expert Robert Banta states would have been a concern. (Austin deposition July 15, 2002)

b. Test 4561 was a 30 mph rear moving barrier impact test. The vehicle used in this test was equipped with a "NON-PRODUCTION REAR PROP SHAFT, 1 INCH SHORT." (Quote from Chrysler test report 4561). The prop shaft connects the rear axle and the drivetrain at the transmission. There is a sliding coupler at the front of the transmission that allows the propshaft some degree of freedom to slide in or out of the transmission as the suspension moves. Since there is contact between the fuel tank and the rear axle in all of the Chrysler rear moving barrier tests for the Jeep Grand Cherokee, this shorter propshaft is significant as it would reduce the force that the rear axle would apply to the fuel tank and make it less likely to suffer damage. This would make judgment that the shorter propshaft is insignificant a poor decision and accepting this test as a certification test willful disregard for the public safety.

c. According to a Fuel System & Impact presentation by Ginny Fischback, "ALL test vehicles need correct parts". (Emphasis, Chrysler). This presentation is Exhibit 1 of Estes deposition.

d. On vehicles equipped with trailer hitches, Chrysler tests both with and without a hitch (Banta, Austin deposition, page 111).

8) FMVSS Certification test (1997 model year). For the 1997 model year FMVSS certification there was an additional test added to the compliance report. The report has conflicting information, in one section it references the prior model year tests, and in another section it just references the later test only. This is test number VC5967. For 1997 Chrysler equipped the Jeep Grand Cherokee with changes to the fuel system and this was Chryslers stated reason for the additional test.

a. A bracket that strengthens the frame rail was used on this test.

b. The additional bracket had nothing to do with the fuel system changes that Chrysler had made.

9) Validation Tests: According to the deposition of Francois Castaing, taken on June 14, 2011 there were "in production" validation tests performed every model year. Castaing stated "we will test cars every year on the assembly line to make sure that as they were made in production, we will do some more testing randomly to make sure that we're complying along the way." For over a 2 year period, from after 5/4/92 test until a passing test on 7/31/94 there were 6 tests run that all resulted in a "fail". It appears that Chrysler did not follow this procedure described by Mr. Castaing.

10) Other Rear Moving Barrier Crash tests: In addition to the 10 tests run up to and including the initial certification tests, there were a total of 29 rear moving barrier tests run by Chrysler. Of all the tests that would be considered a "pass", the test vehicle was equipped with either a trailer hitch, a skid plate, an additional bracket and a full size spare. In fact every test vehicle that achieved a passing result was equipped with a full size spare tire. The subject Morris-Kline 1996 Jeep Grand Cherokee was not equipped with any of these features. I have compiled a summary chart of these crash tests and it is attached to this report.

11) Fuel Filler Hose: The Fuel filler hose is routed through a hole in the frame rail. This is a poor design practice. The frame rail is intended to crush and deform under impact. This can cause relative motion amongst components relative to the frame rail. Since the fuel tank is not attached to this rail, the rail deformation will not necessarily be consistent with the fuel tank location. While this design did pass the FMVSS 301 testing it can be seen in the post test photos that the rubber hose is being stretched away from the tank. The bracket or hitch can improve this. According to a Fuel System & Impact presentation by Ginny Fischback, following the topic of "Fuel system design for safety", one of the design considerations is to consider relative motion of fuel system to body/frame. The routing of a rubber fuel hose through a frame rail does not consider relative motion to body/frame. This presentation is Exhibit 1 of Estes deposition.

12) Fuel system changes to the Jeep Grand Cherokee from 1994 to 1995 model year. (ref. 1995ZJ product plan document) The fuel system for the 1995 model year Jeep Grand Cherokee was changed from a "return" fuel system to a "returnless" fuel system. A returnless system uses one less fuel line and a different type of fuel pressure relief valve. This requires changes to the fuel tank assembly to accommodate the changes to the fuel lines.

13) Spare Tire: The subject Morris-Kline 1996 Jeep Grand Cherokee was equipped with a compact spare tire. From reviewing the test reports and results it is apparent that the use of a full size spare was critical for achieving a passing result for FMVSS 301 rear impact tests. There was never a test resulting in a pass for rear impact where the test vehicle was equipped with a compact spare tire. I have not yet determined if the compact spare tire was standard equipment for 1996. I have been able to determine that the compact spare was standard equipment in 1999, but I have not been able to determine from the materials supplied if this was the case for the 1996 model year. The use of a compact spare tire as standard equipment without certifying it for FMVSS 301 is a reckless and irresponsible action on the part of Chrysler. The sale of a vehicle that does not comply with Federal Motor Vehicle safety standards is also reckless and irresponsible.

14) Review of a crash test of a Ford Explorer run at 70 mph. The Ford Explorer has a gas tank mounted forward of the rear axle. The Explorer is capable of sustaining a rear impact from another vehicle at 70 mph without leakage of fuel.

15) Review of crash test run by the Federal Outdoor Impact Laboratory: This is a test that is a "Ford Taurus into rear of Jeep Grand Cherokee 30% offset, 50 mph". From viewing the test video, it is apparent that there was a massive fuel spill immediately upon impact. From viewing the post- test photographs it can be seen that a component of the tank that the fuel filler and vent hoses attach to has been separated from the tank. This creates a large passage for fuel to come out of the tank which results in the fuel being forced out in a manner that can be described as a "geyser".

It can also be observed from the post- test photos that there appears to be a check valve built into this component that separated from the tank. Had the tank been designed in a manner that the check valve would not separate from the tank, the "geyser" would have been prevented.

This same failure mode can be seen on Chrysler crash test number VC5169 run on June 1, 1994. I have not yet been able to determine what changes Chrysler made to the fuel tank after this test failure result, or what analysis was done to determine a change was not needed.

IX: Alternative Design

1. Fuel tank location: A much better alternative design for fuel tank location would have been to use the same as a 1992 Ford Explorer. The tank in an Explorer is located forward of the rear axle rather than rearward like the Jeep Grand Cherokee is. Chrysler/Jeep had access to all the available data, studies and information on vehicle design at the same time as Ford and they could have made the better design decision for safe fuel tank location.
2. Vehicle Structure: An alternative structural design is necessary to prevent the massive opening in the structure between the fuel tank location and the occupant compartment. It is possible that there were welds missing on the subject vehicle, but due to incomplete discovery it is not possible to review the designs to determine this. The addition of more spot welds (whether any are missing or not) is one alternative to prevent this structural failure. Another alternative is to have a reinforcement in this area.
3. Fuel Tank Protection: Chrysler had alternative designs that would have provided some measure of additional fuel tank protection. At the start of production of the 1993 model year ZJ Chrysler had a good certification result with a test vehicle that was equipped with a trailer hitch. By the 1997 model year Chrysler had passing results for vehicles equipped with either a skidpan, a trailer hitch, or an additional reinforcing bracket. One of these 3 items was required on a vehicle as built in order for it to be considered in compliance with FMVSS 301.
4. Fuel tank Check valve: The check valve installation is defective due to the fact that it is possible to separate it from the fuel tank. An alternative should have been used that would ensure that the check valve stays attached to the tank regardless of what happens to the filler neck. This is especially important with a design like the 1996 Jeep Grand Cherokee where a rubber fuel filler hose is routed through a hole in a frame rail. I do not agree with many of the concepts of the fuel system used on this vehicle so one specific alternative to improve the retention of the check valve may have issues with other defects on this vehicle. One alternative is to use a filler neck that is steel instead of rubber, combined with a rubber grommet feature that allows the filler neck to slide freely in or out of the tank. The check valve can then be installed at the end of this filler tube where it could remain within the tank in foreseeable crash events. Although, this could be an issue with a plastic fuel tank. Another alternative is to ensure that the fuel filler hose always fails instead of the fuel filler check valve becoming disconnected. Another alternative is to ensure that the connection of the flanged component that the check valve is part of has a more secure attachment to the tank. These alternatives are required due to the undesirable condition that Chrysler created by routing the fuel filler tube through a hole in a frame rail.
5. Full Size Spare tire: Chrysler never had a passing test result with a vehicle that was equipped with the standard compact spare tire/wheel assembly. The alternative design would have been to use a full size spare which was installed in all FMVSS 301 certification test vehicles.
6. Fuel filler hose routing: An alternative to the fuel fill hose routing that goes through a hole in the frame rail is to use a routing under or over the frame rail. Ford uses a routing over the frame rail for the Explorer. Starting with the 1999 Jeep Grand Cherokee the fuel filler was routed under the frame rail.

X: Conclusions

A. Had Chrysler designed the 1996 Jeep Grand Cherokee with the fuel tank in a safe location, it is likely [redacted] would not have died from the fire in this accident.

B. Had the rear structure performed so that a large hole did not allow fire into the passenger compartment, then it is likely that Susan Morris-Kline would have had sufficient time to exit the vehicle through the driver's door, which was not jammed.

C. Any 1996 Jeep Grand Cherokee that was not equipped with either a trailer hitch or a skidpan, and a full size spare tire, was not in compliance with Federal Motor Vehicle Safety Standard 301.

D. Chrysler should have recalled all 1993 to 1996 Jeep Grand Cherokees that were not equipped with a trailer hitch or a full size spare.

E. The fuel filler hose design is defective by its routing. It should not have been routed through a hole in a frame rail that is intended to deform in a crash.

Note: This report is subject to amendment and supplementation subject to a review of any additional material and the reports of the defense experts may be rebutted.

Sincerely,

Neil Hannemann

Attachments:

Neil Hannemann curriculum vita
Summary chart of Chrysler Rear Moving Barrier Crash Tests for the "ZJ" Jeep Grand Cherokee.

Additional Reference Material Reviewed:

Federal Motor Vehicle Safety Standard 301, "Fuel System Integrity"

Federal Register, NHTSA Docket No. 92-66, December 14, 1992

Federal Register, NHTSA Docket No. 92-66, April 12, 1996

Federal Register, NHTSA Docket No. 2000-8248, November 6, 2000

Federal Register NHTSA Docket No 2003-16523, December 1, 2003

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Livernois, T., "Books of Knowledge, Drivers of Innovation", Presentation at The Knowledge Advantage Colloquium, November 8-10, 1998

"Test Standards at the Core of Legal Battle", USA Today, February 4, 1997

Chrysler response to NHTSA Docket no. 00-8248

Chrysler Fuel Supply Systems Design Guidelines

Ford Memo to All U.S. Ford and Lincoln Mercury Dealers regarding a Limo Package Upgrade Kit offering. (Tank Shield)

1996 Jeep Grand Cherokee article from Cars.com, L. Printz, January 20, 1996.

Reference Publications:

1988 Chevy Trucks - Target Trucks Selling Guide (references pages regarding fuel tank)
"1991 NASS Data: Fatal Crashes Involving Light Vehicle Fires (portions withheld), NHTSA
"An Assessment of Automotive Fuel System Fire Hazards: Summary Report," N. Johnson, HS 800 623, 12/71
"An Assessment of Automotive Fuel System Fire Hazards, "N. Johnson, HS 800 624, 12/71
"An Evaluation of the U.S. Family Sedan ESV Project," G.H. Alexander, HS 322-3-621, 10/74
"Analysis of Fires in Passenger Cars, Light Trucks & Vans," J. Tessmer, NHTSA, HS 808 208, 12/94
"Automobile Fires in Traffic Crashes," UMTRI Research Review, May/June 1983
"Automotive Collision Fires," D. Severy, et al, SAE Paper No. 741180, 12/74
"Automobile Crashworthiness Rating: Legislation and Testing," C.M. Dixon, SAE Paper No. 862046, 1986
"Automotive Fuel Fed Fire–A Preventative Approach," C. Chiti, S. Garbarino, Alfa Romeo, SAE Paper No. 770170, 03/77
"Automotive Safety Engineer," Roy Haeusler, Chrysler Corp., SAE Paper No. 560299, 1956
"Computer Modeling of Fuel Tank Safety Venting in Full Scale Flametests,"T.L. Oliphant, SAE Paper No. 871560, 1987
"Crashworthy Fuel System Design," S. Robertson, G. Walhout, Aviation Safety Eng. & Research, Automobile Competition Committee for the US, FIA, 05/66
"Design of a Fire Proof Vehicle," C. Chan, et al, U.C. at Berkley, NTIS PB 246 740, 07/75
"Designing Automotive Fuel Systems in High Temperature Plastics," K.W. Nelson, SAE Paper No. 830070, 1983
"Development of Multi-Layer Plastic Fuel Tanks for Nissan Research Vehicle-II," Kurihara, Nakazawa, Oshahi, Momoo and Numazaki (Nissan Motor Corp.), SAE Paper No. 870304, 1987
"Development of Plastic Fuel Tank Using Modified Multi-Layer Blow Molding," Fukuhara, Hara, Matsuura and Watanabe, SAE Paper No. 900636, 1990
"Estimate of the Effect of FMVSS 301–Fuel System Integrity," J. Flora, Jr., J. O'Day, University of Michigan HSRI, Accident Analysis & Prevention 117-132, 1981
"Evaluating Fuel-System Crashworthiness," GM, Automotive Engineering, 04/77
"Evaluation of Federal Motor Vehicle Safety Standard 301-75, Fuel System Integrity: Passenger Cars," (appendices omitted),G. Parsons, NHTSA, HS 806 335, 01/83
Experimental Safety Vehicle (Phase Two) Developed by General Motors, Report No. DOT/HS-800 659, Contract No. DOT-OS-00095, June 1972
"FMVSS 301 Crash Test Vehicles," NHTSA, 1981
"Feasibility Study of New York State Safety Car Program, Final Report," Fairchild Hiller, 08/66
"Final Report, Phase, I, Experimental Safety Car Study," American Machine & Foundry Company, 08/68
"Fires and Burns in Towed Light Passenger Vehicle Crashes," S. Partyka, NHTSA, 7/21/92; "Origin of Fire in Towed Light Vehicle Crashes" (draft), 10/92

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"Fuel System Integrity," Donald Reed for Automotive Engineering, June 1995
"Fuel Tank Heat Shield Design," C. Jordan and D. Matkovich, SAE Paper No. 902259, 1990
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"Impact-Induced Car Fires–A Comprehensive Investigation," A. Malliaris, 23 Accident Analysis & Prevention 257-273, 1991
"Incidence of Fire in Plastic Fuel Tank Vehicles," N. Bondy, NCSA, 2/81
"Investigation of Collision-Related Vehicle Fires," J. Habberstad, J. Collins, Highway Collision Reconstruction, ASME, pp. 1-14, 1980
"Investigation of Motor Vehicle Performance Standards for Fuel Tank Protection: Phase I Final Report," Fairchild Hiller, 09/67
"Investigation of Motor Vehicle Performance Standards for Fuel Tank Protection, Volume I," Fairchild Hiller, 09/67
Memorandum summarizing 6 baseline vehicle crash tests conducted by Calspan, NHTSA, 10/15/93
Mercedes-Benz Brochure entitled "30 years of Accident Testing-50 Years of Passive Safety"
"Motor Vehicle Fires in Traffic Crashes & the Effects of the Fuel System Integrity Standard," G. Parsons, NHTSA, HS 807 675, 11/90
"New Energy-Absorbing Materials for Crash Resistant Fuel Tanks," W.C. McDonald, SAE Paper No. 680210, 1968
"New Look at Fuel System Design Criteria," S. Robertson, SAE Paper No. 660794, 11/66
"Perspective on Automobile Crash Fires," C. Warner, et al, Collision Safety Engineering, SAE Paper No. 850092, 1985
"Plastic Fuel Tanks in the Federal Republic of Germany and in Europe," K.-D Liehr, SAE Paper No. 880686, 1988
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"The Relationship between Automobile Construction and Accidents," Maxwell N. Halsey, SAE Paper No. 320056, June 1932

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