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Headline

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Headline2

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11-4-2014

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Man_dead_after_natural_gas_truck_explodes_in_Howard[1]

[redacted]

Man dead after natural gas truck explodes in Howard

Written by Press-Gazette Media
Apr. 4, 2014 |

postcrescent.com

HOWARD — A truck driver was killed and another man was critically injured Thursday when a truck's fuel system exploded near an industrial park, officials said.

Ed Janke, public safety director of the village of Howard, said the explosion — reported around 1:30 p.m. — appears to be the result of a shifting load compromising the truck's fuel system.

The Brown County Sheriff's Office said the truck had slowed for a turn when the its load of heavy equipment moved forward and penetrated the truck's compressed natural gas fuel system, causing it to explode.

"The truck slowed to turn into a driveway and the load shifted inside, apparently, and that compromised the compressed natural gas fuel system on the truck," Janke said. "The fuel system subsequently detonated."

The male driver was pronounced dead at the scene and a male passenger was thrown from the cab and transported to a hospital with what are described as critical injuries, the Brown County Sheriff's Office said in a written statement.

About an hour after the original report, the truck's cab sat cocked forward on its chassis near the corner of Pamperin and Cornell roads in the Howard Industrial Park. Crews remained on the scene into late afternoon.

Several businesses in the area were evacuated as a precaution, but Janke said later that people have been allowed to return to work.

The truck is owned by Ace Manufacturing Industries Inc., which is located on Pamperin Drive. It was operating between two Ace Manufacturing Industries Inc. facilities in the area, Janke said.

"This is the first time I have seen the catastrophic release of a compressed fuel system like that," Janke said. "We were very concerned about additional explosions. We weren't sure what caused the original explosion, so we created a safe area."

A hazardous material team was called to the scene, evaluated the area for any danger and determined no threat remained. The Brown County Sheriff's Department is investigating the incident.

A number of people at the scene talked about how they heard a loud boom and followed the firefighters to see the source of the noise.

"I was just sitting watching a baseball game and I heard a big ka-boom," said [redacted], who lives about a mile from the scene. "I knew it wasn't thunder. I didn't know what the heck it was.

"It was a big boom. It was loud enough it made my heart shudder."

PE14-020

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NO LETTER

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INDIANA UNIVERSITY

TRANSPORTATION RESEARCH CENTER

ON-SITE COMPRESSED NATURAL GAS VEHICLE EXPLOSION INVESTIGATION

FOR THE OFFICE OF DEFECTS INVESTIGATION (ODI)
CASE NUMBER - [redacted]
LOCATION - WISCONSIN
VEHICLE - 2014 FREIGHTLINER M2 112
INCIDENT DATE - April 2014

Contract Number: [redacted]

Prepared for:

U.S. Department of Transportation
National Highway Traffic Safety Administration
National Center for Statistics and Analysis
Washington, D.C. 20590-0003

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The crash investigation process is an inexact science which requires that physical evidence such as skid marks, vehicular damage measurements, and occupant contact points be coupled with the investigator's expert knowledge and experience of vehicle dynamics and occupant kinematics in order to determine the pre-crash, crash, and post-crash movements of involved vehicles and occupants.

Because each crash is a unique sequence of events, generalized conclusions cannot be made concerning the crashworthiness performance of the involved vehicle(s) or their safety systems.

Technical Report Documentation Page

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9. Performing Organization Name and Address Transportation Research Center Indiana University 501 South Madison Street, Suite 105 Bloomington, Indiana 47403-2452		10. Work Unit No. (TRAIS) 11. Contract or Grant No. [redacted]
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15. Supplementary Notes

On-site compressed natural gas vehicle explosion investigation involving a 2014 Freightliner M2 112.

16. Abstract

This on-site investigation focused on the Compressed Natural Gas (CNG) fuel system of a 2014 Freightliner M2 112. One of the vehicle's five CNG fuel cylinders was punctured by the left fork of an unsecured Yale Type E forklift located in the cargo box of the Freightliner, resulting in an explosion of the fuel cylinder. There was no fire. This incident occurred on a two-lane roadway in an industrial park. The Freightliner was a two-door straight truck equipped with a CNG fuel system, consisting of five CNG fuel cylinders stacked vertically and secured within an aluminum cabinet located between the truck cab and cargo box. The cylinders had been filled the previous evening and the truck was used in the morning on the day of the incident. While the specific fill level of the CNG tanks is not known, it was reported by an investigator from the Clean Vehicle Education Foundation that the CNG cylinders were nearly full at the time of the incident. A restrained [redacted]-year-old male driver and a restrained [redacted]-year-old male front right passenger occupied the vehicle. The Freightliner was traveling east and was transporting an unsecured Yale Type E forklift. The Freightliner's driver was braking to initiate a right turn into a driveway when the forklift was displaced forward as a result of the deceleration and the forks impacted and pierced the front panel of the cargo box. The left fork then impacted and ruptured the lowest of the five CNG fuel cylinders resulting in a explosion. The driver sustained fatal injuries and expired at the scene. The front right passenger sustained police reported "A" (incapacitating) injuries and was transported by ambulance to a hospital where he was admitted for one day.

17. Key Words		18. Distribution Statement	
Compressed Natural Gas Explosion	Motor Vehicle Traffic Incident Fatal Injury Severity	General Public	
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INDIANA UNIVERSITY

TRANSPORTATION RESEARCH CENTER
ON-SITE COMPRESSED NATURAL GAS VEHICLE EXPLOSION INVESTIGATION

FOR THE OFFICE OF DEFECTS INVESTIGATION (ODI)
CASE NUMBER - [redacted]
LOCATION - WISCONSIN
VEHICLE - 2014 FREIGHTLINER M2 112
CRASH DATE - April 2014

BACKGROUND

This on-site investigation focused on the Compressed Natural Gas (CNG) fuel system of a 2014 Freightliner M2 112 (**Figure 1**). One of the five CNG fuel cylinders was punctured by the left fork of an unsecured Yale Type E forklift located in the cargo box of the Freightliner resulting in a explosion of the fuel cylinder. There was no fire. This investigation was initiated by the National Highway Traffic Safety Administration (NHTSA) on April 15, 2014 through the Office of Defects Investigation (ODI), which was responding to an on-line news article. This investigation was assigned on April 17, 2014 when cooperation to inspect the Freightliner was finalized with the vehicle's owner. The incident involved the Freightliner and the Yale Type E forklift located within the cargo box of the vehicle. This incident occurred in April 2014 at 1335 hours, in Wisconsin and was investigated by a local police agency. The Freightliner and incident scene were inspected on April 22, 2014. Interviews with the front right passenger of the Freightliner, the owner of the Freightliner, and the city public safety director were also conducted on April 22, 2014.

Figure 1: On-scene police photograph of the damaged 2014 Freightliner M2 112

This incident occurred on a two-lane roadway in an industrial park. The Freightliner was a two-door straight truck equipped with a CNG fuel system, consisting of five CNG fuel cylinders oriented horizontally and stacked vertically within an aluminum cabinet located between the truck cab and cargo box. The cylinders had been filled the previous evening and the truck was used in the morning on the day of the incident. The fill level of the CNG tanks could not be determined. A restrained [redacted]-year-old male driver and a restrained [redacted]-year-old male front right passenger occupied the vehicle. The Freightliner was traveling east and was transporting an unsecured Yale Type E forklift. The Freightliner's driver was braking to initiate a right turn into a driveway when the forklift was displaced forward as a result of the deceleration and the forks impacted and pierced the front panel of the cargo box. The left fork then impacted and ruptured the lowest of the five CNG fuel cylinders resulting in a explosion. There was no fire. The driver sustained fatal injuries and expired at the scene. The front right passenger sustained police reported "A" (incapacitating) injuries and was transported by ambulance to a hospital where he was admitted for one day.

Incident Site: This incident occurred during daytime hours on a two-lane roadway in an industrial park. The weather conditions were clear with 10 mile visibility, northeasterly winds at 27 km/h (17 mph), a temperature of 0.6° C (33° F), and dew point of -2° C (28° F), according to local weather reports. The bituminous roadway traversed in an east-west direction and had one through lane in each direction that were bordered by gravel shoulders approximately 2 m (6.5 ft) in width. The eastbound lane was 3.5 m (11.5 ft) wide and the westbound lane was 4 m (13.1 ft) wide. The roadway pavement markings consisted of a broken yellow center line. The roadway was level and the speed limit was 56 km/h (35 mph). The Incident Diagram is included on page 13 of this report.

Pre-Incident: The forklift was driven into the Freightliner's cargo box at a factory loading dock by the driver of the Freightliner, and the forks were lowered to the floor of the cargo box. It was reported in the police reconstruction report that the forklift's shift lever was placed in neutral and the parking brake was set. The forklift was not secured with straps nor were the wheels blocked. It was also reported in the police reconstruction report that, based on information from representatives of a local Yale forklift dealer, the parking brake was designed only to hold the forklift in place on a ≤15% grade. It was not designed to prevent the forklift from rolling during transport. The forklift's specific location within the cargo box is unknown, since only the driver of the Freightliner was involved in loading it onto the truck and he sustained fatal injuries during the incident. The driver of the Freightliner intended to travel from the loading dock to the street, turn right, and travel to a second building located approximately 500 m (1,640 ft) from the loading dock where the driver and right passenger would deliver the forklift and pick up a table. The Freightliner was traveling east in the right lane approaching the driveway to the second building (**Figure 2**) at a travel speed, estimated by the right passenger, of 40 km/h (25 mph). The passenger stated during the SCI interview that he and the driver were conversing, and it was necessary for him to alert the driver that they were approaching the driveway to their destination. He further stated the driver then pumped the brakes to reduce the Freightliner's speed.

Figure 2: Freightliner's eastbound approach to the driveway (on right) and area of explosion

Incident: The unsecured forklift traveled forward in the cargo box as the driver braked. The front forks pierced the front panel of the cargo box and the left fork impacted the lowest of five CNG fuel cylinders that were oriented horizontally and stacked vertically within an aluminum cabinet located between the truck cab and cargo box. The impact site on the CNG cylinder was located 65 cm (25.6 in) left of the right cylinder end. This impact resulted in a rupture and explosion of the cylinder. There was no fire. The Freightliner's air lines were severed and the wheels locked, leaving police-reported skid marks that ranged from 4.3 - 7.44 m (14.1 - 24.4 ft) in length as the vehicle skidded to final rest, heading southeast. A speed to skid to a stop calculation based on the longest skid mark length and a deceleration value range[1] of 0.41 - 0.56 g yielded a speed range at the onset of the skid

[1] Traffic Accident Reconstruction, Volume 2 of The Traffic Accident Investigation Manual by Lynn B. Fricke, Northwestern University Traffic Institute, 1990

of 27.8 km/h (17.3 mph) - 32.5 km/h (20.2 mph). The force of the explosion resulted in severe damage to the frame, undercarriage, cargo box, fuel cabinet, CNG cylinders, and cab of the Freightliner.

Post-Incident: The police were notified of the incident at 1336 hours and arrived on scene at 1342 hours. Fire, rescue, and medical personnel responded to the incident. The front right passenger of the Freightliner stated during the interview that he checked on the driver and attempted to awake him from unconsciousness but was unsuccessful. He noticed the smell of natural gas and climbed out of the right front window which had disintegrated from the explosion. The driver of the Freightliner sustained fatal injuries and expired at the scene. The front right passenger sustained police reported "A" (incapacitating) injuries and was transported by ambulance to a hospital where he was admitted for two days. The Freightliner was towed from the incident scene due to damage.

2014 FREIGHTLINER M2 112

DESCRIPTION

The Freightliner was a rear wheel drive, 6 x 4, two-passenger, straight truck (VIN: 1FVHC5DX9EHxxxxxx) that was manufactured in August 2013 and was equipped with an 8.9-liter I-6 engine powered by compressed natural gas, a ten-speed automatic transmission, four-wheel anti-lock brakes, and a 6.1 m (20 ft) long cargo box. The windshield glazing was AS1 laminated and the left, right, and backlight glazings were AS2 tempered. The glazing for all non-fixed windows were closed at the time of the incident. The specified wheelbase was 472 cm (186 in).

The vehicle manufacturer's recommended tire size was 295/75R22.5 The vehicle was equipped with tires sized 295/75R22.5 and 275/80R22.5 on the front and rear wheels, respectively. The manufacturer's recommended cold tire pressure for the front and rear tires was 758 kPa (110 psi).

The vehicle was equipped with driver and right passenger cloth-covered, box-mount bucket seats with integral head restraints.

EXTERIOR DAMAGE

Frame and Undercarriage: The explosion deformed the truck frame directly below the fuel cylinder cabinet (**Figure 3**). Both frame rails were bent, as were the frame cross members fore and aft of the cylinder cabinet. The center section of the drive shaft was fractured and separated from the transmission. The air brake lines were severed and the air brake tank was also slightly displaced. The rear engine mounts were undamaged.

Figure 3: Freightliner's undercarriage damage directly under fuel cabinet

Passenger Cab: The cab of the truck was heavily damaged from the explosion (**Figure 4**). The most

severe damage occurred below and behind the driver's seat . The entire cab was displaced upward and forward approximately 40 cm (15.7 in) and the back panel of the cab was torn vertically, intruding into the passenger area. Shards of carbon fiber wrap and fiberglass from the ruptured cylinder were found throughout the inside of the cab and the windshield was holed from the force of the explosion.

Figure 4: Police on-scene photograph of damage to cab of the Freightliner

Cargo Box: The truck's cargo box (**Figure 5**) was also heavily damaged from the explosion. The front panel was largely displaced from the main structure. The roof and rear door panels completely detached and the left side panel was partially detached. There was slight damage to the floor and right side panel.

Figure 5: Police on-scene photograph of damage to the Freightliner's cargo box

Cargo: The only cargo was a Yale Type E battery powered forklift, Model ERP040TFN03739W. The forklift (**Figure 6**) measured 306 cm (120.5 in) from back to fork tips and weighed 4,035 kg (8,896 lb). Each fork was 106 cm (41.7 in) in length and 10 cm (3.9 in) in width. The forks were 1.5 cm (0.5 in) thick at the tips and 4 cm (1.6 in) at the base and were set 49 cm (19.3 in) apart from each other. A parking brake was located on the left side of the instrument panel and was engaged at the time of the incident.

Figure 6: Yale Type E forklift (in cargo box at time of incident)

CNG Cylinder Cabinet Damage

The cabinet for the CNG cylinders was manufactured by Agility Fuel Systems and was located between the cab and cargo box. The cabinet included an aluminum support structure that measured 217 cm (85.4 in) in height and 53 cm (20.9 in) in width, which was encased by aluminum sheeting. There was no protective barrier between the CNG cabinet and the cargo box. The rack allowed for five CNG cylinders to be mounted by the neck, horizontally onto cross members. The cylinders were stacked vertically in the cabinet. The cabinet sustained severe damage as a result of the explosion (**Figure 7**). The sheet metal encasing the cabinet was mostly displaced from the vehicle, with only the forward panel remaining attached. The left rear vertical frame member fractured and separated 88 cm (34.6 in) from the bottom support and the front vertical frame member

was rotated 90 degrees to the left. All cross members, on both sides, were either fractured, displaced, or bent (**Figure 8**).

Figure 7: Left side damage to fuel cabinet

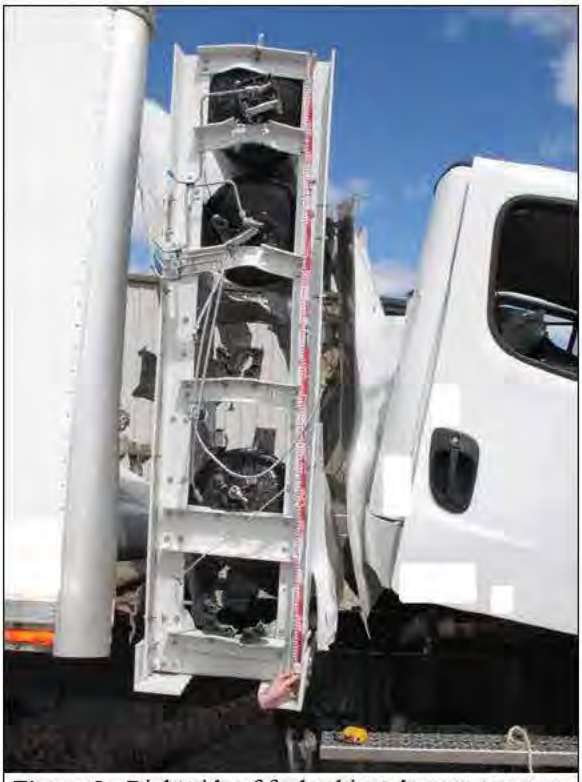


Figure 8: Right side of fuel cabinet damage to cross members

CNG Cylinders and Damage

The five CNG cylinders were Type 4 design (polymer liner with carbon fiber and fiberglass overwrap), manufactured by Hexagon Lincoln, Model number RH36A16-07601. Each cylinder measured 205 cm (80.6 in) in length, 41 cm (16 in) in diameter, and were certified with ANSI NGV2 and FMVSS 304. Each cylinder was equipped with a Pressure Relief Device (PRD) at each end, which was designed to pipe discharge away to the top of the cabinet in the event of a breach of the system. Each cylinder had a manual valve without an excess flow device that was manufactured by OMB. The bottom cylinder (cylinder 1) was impacted by the left fork of the forklift and ruptured (**Figure 9**), with the damage starting 65 cm (25.6 in) left of the right end of the cylinder. A 66 cm (26 in) section of the left end of the cylinder (**Figure 10**) separated and was displaced into the street (**Figure 11**). Both valves separated from the bottom cylinder. Cylinder 2 remained intact, but the left side dropped from its mount. The left side valve was detached and part of the right side valve remained in place. Cylinder 3 was propelled out of the cabinet and landed in the street, according

Figure 9: Ruptured CNG cylinder

to incident documents. At least one valve remained attached to the cylinder. Cylinders 4 and 5, at the top of the cabinet, remained in their positions and all valves remained attached.

Figure 10: Displaced section of ruptured CNG cylinder

Figure 11: Police on-scene photograph showing location of displaced section of bottom CNG cylinder (arrow)

Figure 12: Exterior view of intrusion of back wall of Freightliner's cab

Interior Damage

The interior of the Freightliner sustained severe damage from the CNG cylinder explosion. There were a total of twelve intrusions to the passenger compartment. The most severe intrusions occurred in the driver's space and were to the back wall of the cab and the backlight header (**Figures 12** and **13**), which intruded longitudinally approximately 80 cm (31 in), and 30 cm (12 in), respectively, and the floor, which intruded vertically approximately 40 cm (16 in). The driver was projected forward by the explosion and he loaded the steering assembly (**Figure 13**), displacing it forward approximately 25 cm (10 in). Scuff marks were noted on the roof above the driver's seat, possibly from contact by the driver's head. The rearview mirror was also displaced from possible contact by the driver's right hand. Fragments of fiber glass from the ruptured CNG tank were also deposited throughout the cab. Some of the fragments cut the ceiling upholstery in the front right passenger's space, and fragments were embedded in the roof and damaged a plastic storage compartment in this area. Both doors were jammed shut and the left door was mechanically pried open by rescue personnel. The windshield was in place and holed due to explosion forces. The right and left glazings as well as the backlight all disintegrated due to the explosion. The only undamaged glazings were the small windows on each door.

Manual Restraint Systems

The front seating positions were equipped with lap and shoulder safety belts with fixed upper anchors.

The driver was restrained by the lap and shoulder safety belt based on the police-reported statement of a witness who was one of the first to arrive at the vehicle immediately following the

incident. The front right passenger stated during the interview that he was restrained by the lap and shoulder safety belt. He sustained a contusion across his chest consistent with safety belt usage. Inspection of both safety belt assemblies revealed evidence of historical usage, but no discernable evidence of loading was found.

Figure 13: Intrusion of the back wall of the Freightliner's cab and displacement of the steering column from driver contact

CNG Fuel System Inspection by Other Party

The Freightliner and its fuel system were inspected by the Director of Technology for the Clean Vehicle Education Foundation. A summary of findings from his preliminary report[2] relative to the CNG fuel system are as follows:

1. The neck mounts on all five cylinders were broken by the pressure wave and there were many fractures of the aluminum supporting structure.

2. The right front vertical member of the supporting structure was bent into a radius, apparently by the rupturing cylinder when it was propelled forward and to the right by the escaping gas.

3. All of the high-pressure CNG from the system escaped through the broken cylinder connections in about ten minutes following the arrival of the first responders. There was no ignition and no fire.

4. The composite fracture apparently progressed approximately in a longitudinal direction and then turned and ran circumferentially, separating one of the cylinder ends and ejecting it from the driver's side of the truck.

5. No existing reports of such low velocity, high momentum and concentrated impacts against fiber reinforced composite pressure vessels have been identified. This impact scenario is unlike either the blunt impacts imposed during the NGV2 drop tests or the high-velocity impact of the NGV2 penetration test (gunfire). The sharpness of the fork tip and its point of impact directly into the cylinder sidewall are also unlike the previous oblique severe impacts of roof-mounted cylinders against overhead obstruction. This is the first rupture incident apparently resulting from impact on a NGV2 cylinder made since the drop impact tests were strengthened in 1998.

6. The pressurized cylinder had enhanced sidewall rigidity because it was nearly full. This rigidity probably prevented general deflection in the sidewall (to an oval shape). This deflection is

[2] The report was obtained from the investigating police agency. There was no prohibition specified in the report regarding the dissemination of the preliminary findings.

considered favorable in reducing impact damage to an empty cylinder. A more compliant, less pressurized cylinder could have deflected and reduced damage at the point of impact.

7. The cylinder was possibly more rigidly attached to the massive truck chassis because it was the bottom cylinder in a framework rigid enough to carry a five-high stack of cylinders. The cylinder thus could not move away from the impact to reduce the damage at the point of impact.

8. The shape of the fork tip probably produced a cut perpendicular to the critical hoop direction reinforcing fibers. These fibers carry the greatest load in a pressure vessel and the orientation of the fork tip was such to maximize the number of hoop fibers that were damaged.

9. If the fork tip penetrated the sidewall of the cylinder it would have wedged the break open because the long taper of the fork. This could have inflicted greater damage than a simple penetration by a 2 mm x 60 mm point.

10. A low impact speed with high momentum may be more damaging to composites than a high velocity impact.

11. Information from tests and other accidents indicate that CNG cylinders resist rupture as a result of more blunt impacts. This may be a more likely damage scenario from general loose cargo. The occupant space in the cab could receive considerable protection from the cylinders and mounting structure.

2014 FREIGHTLINER M2 112 OCCUPANTS

DRIVER DEMOGRAPHICS

Age/Sex:	[redacted] years [redacted]
Height:	[redacted]
Weight:	[redacted]
Eyewear:	[redacted]
Seat Type:	Pedestal
Seat Track Position:	Unknown
Manual Restraint Usage:	Lap and shoulder safety belt
Usage Source:	Witness statement
Air Bags	None
Alcohol/Drug Involvement:	None
Egress from Vehicle:	Removed by emergency responders
Transport from Scene:	Transported from scene for autopsy
Medical Treatment:	None, deceased at scene

DRIVER INJURIES [redacted]

Injury Number	Injury	AIS 2005/08	Injury Source	Confidence Level
1 2	Hemorrhage, subarachnoid over both cerebral hemispheres, not further specified	140693.2,1 140693.2,2	Steering wheel rim	Probable
3	Fracture right orbital plate, not further specified	251200.2,1	Steering wheel rim	Probable
4	Fracture nose with displacement (deformity), not further specified	251002.2,4	Steering wheel rim	Probable
5	Laceration pericardium with residual blood in sac	441602.2,4	Steering wheel hub and/or spokes	Certain
6	Laceration (tear) right and left atria, not further specified	441016.6,4	Steering wheel hub and/or spokes	Certain
7	Laceration (tear), multiple, thoracic aorta, not further specified	420206.4,4	Steering wheel hub and/or spokes	Certain
8	Laceration (rupture) left diaphragm with protrusion of stomach into left chest cavity	440610.4,2	Steering wheel hub and/or spokes	Certain
9	Fractured ribs, multiple, bilaterally, right greater than left	450203.3,3	Steering wheel hub and/or spokes and rim	Certain
10	Contusions bilateral pleural surfaces of lungs, not further specified	441420.3,3	Steering wheel hub and/or spokes	Probable
11	Lacerations bilateral pleural surfaces of lungs with extensive parenchymal hemorrhage	441450.4,3	Steering wheel hub and/or spokes	Certain
12	Hemothoraces, bilaterally, with residual blood in each pleural cavity, not further specified	442200.3,3	Steering wheel hub and/or spokes and rim	Certain
13	Laceration left kidney, not further specified	541620.2,2	Steering wheel rim	Certain
14	Lacerations, multiple, capsule of liver, with internal crush injury of parenchyma, not further specified	541826.4,1	Steering wheel hub and/or spokes and rim	Certain
15	Laceration capsule of spleen with fragmentation of spleen, not further specified	544226.4,2	Steering wheel hub and/or spokes and rim	Certain
16	Fracture, palpable, right shoulder, not further specified	751800.2,1	Seat back, driver's	Probable
17 18	Lacerations (cuts) right side of face from right periorbital area to right chin, not further specified	210602.1,1 210602.1,8	Noncontact injury: flying glass, back light	Probable
19	Lacerations (cuts) right side of neck, not further specified	310602.1,1	Noncontact injury: flying glass, back light	Probable

***Driver Injuries** (Continued)* [redacted]

Injury Number	Injury	AIS 2005/08	Injury Source	Confidence Level
20	Laceration, stellate tear, open wound, right lower quadrant of abdomen, not further specified	510602.1,1	Steering column and/or tilt adjustment lever	Probable
21	Abrasions, multiple, posterior right upper arm from shoulder to elbow	710202.1,1	Noncontact injury: flying glass, back light	Probable
22	Laceration (cut) posterior right arm near elbow	710602.1,1	Noncontact injury: flying glass, back light	Probable
23	Abrasions, multiple, dorsal (posterior) left wrist, not further specified	710202.1,2	Noncontact injury: flying glass, back light	Probable
24	Lacerations, multiple, dorsal (posterior) right hand	710602.1,1	Noncontact injury: flying glass, back light	Probable
25	Abrasions, multiple, on bilateral thighs, not further specified	810202.1,3	Steering wheel rim	Probable
26	Abrasions, multiple, on lower legs, not further specified	810202.1,3	Left lower instrument panel	Certain
27	Contusions, multiple, on proximal bilateral thighs, not further specified	810402.1,3	Steering wheel rim	Probable
28	Contusions, multiple, on lower legs, not further specified	810402.1,3	Left lower instrument panel	Certain
29	Laceration, open, just below and lateral to left knee with foreign material embedded	810602.1,2	Left lower instrument panel	Certain

Source: Autopsy Records.

DRIVER KINEMATICS

The driver was restrained by the lap and shoulder safety belt. He was displaced forward and upward as a result of explosion forces and intrusion of the back wall of the cab. His face and chest loaded the steering assembly causing a subarachnoid hemorrhage, fracture of the right orbital plate and nose, lacerations of the pericardium, right and left atria, thoracic aorta, and diaphragm. He also sustained bilateral fractures of multiple ribs, contusions and lacerations of the lungs, and lacerations of the left kidney, liver, and spleen from contacting the steering assembly. Contact with the seat back caused a fracture of the right shoulder, and he sustained multiple lacerations and abrasions from flying glass from the disintegrated backlight. He also sustained multiple abrasions and contusions to the lower extremities from contacting the lower left instrument panel and steering wheel rim, and an open laceration of the left lower leg, also from contacting the lower left instrument panel. The driver injuries were fatal and he was officially pronounced deceased at 1640 hours.

FRONT RIGHT OCCUPANT DEMOGRAPHICS

[redacted]

Age/Sex:	[redacted] years
Height:	[redacted]
Weight:	[redacted]
Eyewear:	[redacted]
Seat Type:	Pedestal
Seat Track Position:	Unknown
Manual Restraint Usage:	Lap and shoulder safety belt
Usage Source:	Passenger interview and injury data
Air Bags	None
Alcohol/Drug Involvement:	None
Egress from Vehicle:	Exited without assistance through disintegrated right front window
Transport from Scene:	Ambulance
Medical Treatment:	Hospitalized one day

FRONT RIGHT OCCUPANT INJURIES

Injury Number	Injury	AIS 2005/08	Injury Source	Confidence Level
1	Traumatic (closed) head injury, not further specified, with mild headache	110009.1,0	Noncontact injury: impact (blast) forces	Probable
2	Contusion, acute left lung, left upper lobe, secondary to explosion/blast	441420.3,2	Noncontact injury: impact (blast) forces	Certain
3	Contusion posterior scalp, not further specified	110402.1,6	Seat back, front right passenger's	Probable
4	Laceration, 1.3 cm (0.5 in) in length on right posterior scalp	110602.1,6	Other interior loose object: fiber glass debris	Probable
5	Avulsed (missing) gum tissue from upper right incisor area	243206.1,8	Right instrument panel	Probable
6 7	Abrasions, superficial, to right side of nose and lower lip	210202.1,4 210202.1,8	Right instrument panel	Probable
8	Abrasion across mid chest with bilateral tenderness, not further specified	410202.1,4	Torso portion of safety belt system	Certain
9	Penetrating (puncture) injury back of left shoulder, one near arm pit, one over scapula	716011.1,2	Other interior loose object: fiber glass debris	Certain
10	Laceration, 2.5 cm (1 in), vertically oriented, above right knee	810602.1,1	Right lower instrument panel	Probable
11	Laceration, 2.5 cm (1 in), horizontally oriented, below right knee	810602.1,1	Right lower instrument panel	Probable
12	Abrasion left lower leg, probably left knee, not further specified	810202.1,2	Right lower instrument panel	Probable

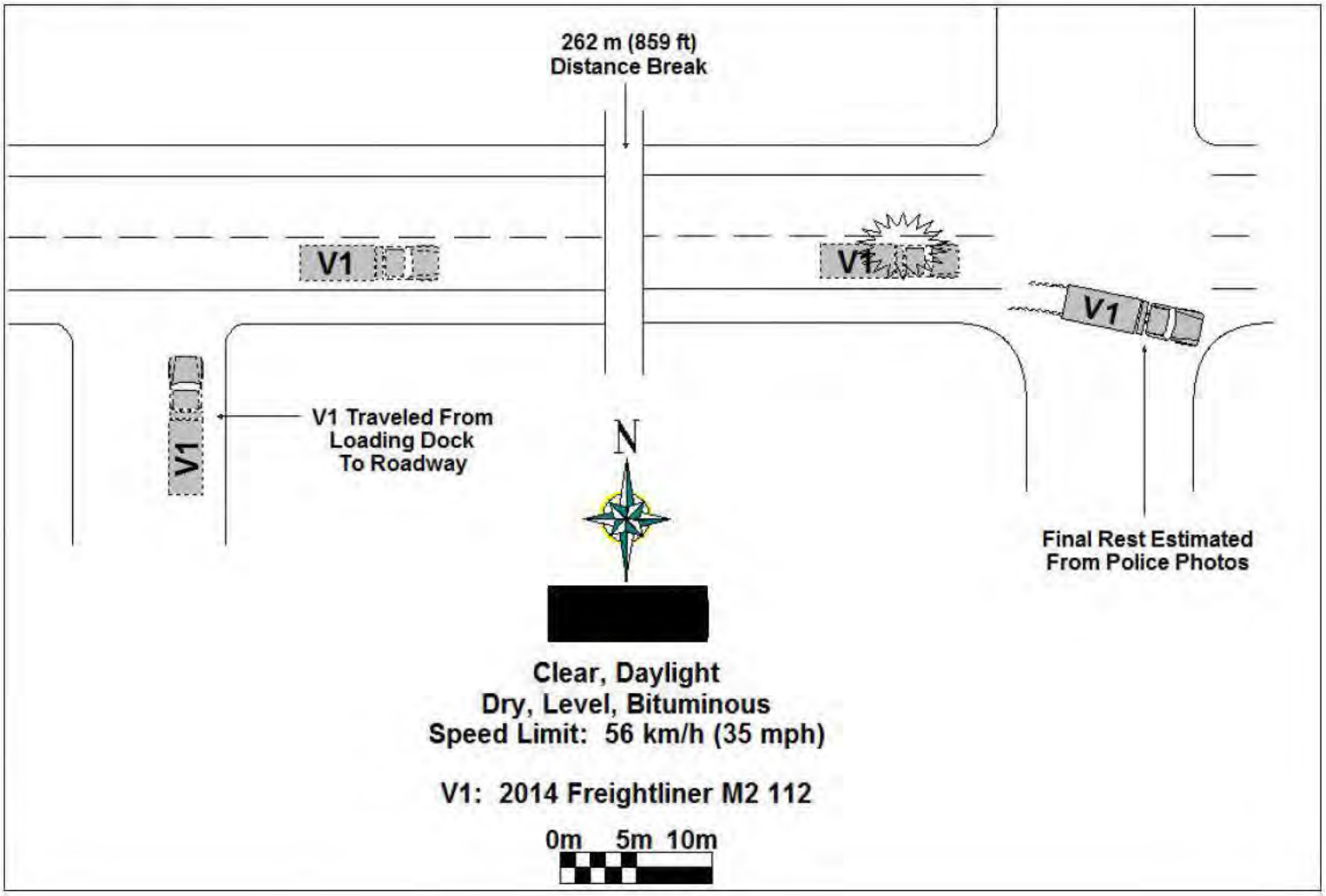
Front Right Occupant Injuries ***(Continued)*** [redacted]

Sources: Emergency Room Records, Hospitalization Records, and Interviewee Data–Same Person. Injury Numbers 4 and 9 through 11 came only from ***Interviewee Data****. Injury Numbers 3, 5, and 12 came only from* ***Emergency Room Records****. Injury Number 8 came only from* ***Hospitalization Records****. Injury Numbers 1 and 2 came from a combination of* ***Emergency Room*** *and* ***Hospitalization Records****. Injury Numbers 6 and 7 came from all three sources.*

FRONT RIGHT OCCUPANT KINEMATICS

The front right passenger was restrained by the lap and shoulder safety belt and was displaced forward as a result of explosion. The blast forces caused a closed head injury and left lung contusion. He loaded the safety belt causing an abrasion across his chest, and contacted his face on the right instrument panel causing an abrasion on the nose and lower lip, and an avulsion of the gum. His lower extremities contacted the right lower instrument panel causing a laceration above and below the right knee and an abrasion on the left knee. He rebounded back into his seat and contacted the back of his head on the seat causing a contusion to the posterior scalp. Flying fiber glass fragments from the exploded CNG cylinder caused two puncture injuries to the back of the left shoulder and a laceration to the back of the head. The front right passenger exited the vehicle without assistance through the disintegrated right side window glazing. He was transported by ambulance to a hospital where he was admitted for one day.

INCIDENT DIAGRAM [redacted]



PE14-020

11-4-2014

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[redacted]

[redacted]

NGVAMERICA
Natural Gas Vehicles for America

MEMBER NEWSLETTER

Advocating the increasing use of NGVs where they benefit most.
For the economy. For the environment. For health. For security. For America.

April 4, 2014
Volume 17 Edition 14

Man Dies in Natural Gas Truck Accident

On Thursday, an accident occurred in the Village of Howard, Wisconsin, outside of Green Bay, involving a natural gas truck in which the driver was killed and the passenger hospitalized. News and police reports indicate that the accident appeared to be the result of a heavy shifting load compromising the truck's fuel system. The load in this case was a forklift truck that slid forward as the vehicle slowed to turn, penetrating the back-of-cab-mounted CNG fuel system. *There was no detonation or a thermal event in this tragic accident.*

Below is a summary of information currently available to NGVAmerica:

- The Freightliner box-style truck was transporting a large forklift truck from one facility to another about 300 yards away.
- When the driver braked to pull into the driveway, the forklift rolled toward the front of the vehicle, forks forward, penetrating through the trailer wall and into the cylinder cabinet (which had been manufactured by Agility Fuel Systems).
- A view from the front shows a Type IV Hexagon Lincoln neck-mount cylinder.
- A picture of the truck taken from the driver's side-view appears to show that the fork carriage pushed the whole cylinder cabinet and truck cab forward.
- Two lower cylinders are missing from the cylinder cabinet. The bottom cylinder was impacted by a fork near the top of the sidewall and ruptured into two pieces
- The other cylinder was blown clear but did not rupture.
- The valve was broken off of the middle cylinder when it was forced out of the neck mount.
- The two top cylinders are still in their mounts.
- The escaping gas pushed the cab floor almost to the windshield. The driver was killed and the passenger was ejected through the windshield.
- The drive shaft was bent into a U and the engine blown off its mounts.
- Natural gas was still escaping from broken lines when the first responders arrived.
- One end of a cylinder is on the ground some distance from driver's side of the truck. It looks like a clean circumferential break indicating that the helical plies failed but not the hoop plies. White glass fibers are apparent at the break.

The industry, NGVAmerica and CVEF will continue to work with authorities to investigate the incident. We will keep our members informed as new information becomes available.

Senate Finance Committee Considers Tax Extenders

This week, the Senate Finance Committee considered and passed, on a bipartisan vote, the *Expiring Provisions Improvement Reform and Efficiency (EXPIRE) Act*, a "tax extenders" bill. The bill seeks to extend tax incentives that either expired on December 31, 2013 or are set to lapse at the end of 2014. Of importance to the NGV industry, the legislation includes two one-year extensions (from January 1, 2014 thru December 31, 2015) for the preexisting the 50 cent per gallon alternative transportation fuel tax credit and the alternative fuel vehicle refueling property tax credit. The passage of this legislation by the Senate Finance Committee is the first step by the Congress to address the expired tax provisions. These provisions must still be considered by the full Senate and the House of Representatives before it can be sent to the President. Legislative language, amendment text and related materials are all available on the website of the Senate Finance Committee

at: [redacted]. For more information, contact Paul Kerkhoven at 202.824.7363 or pkerkhoven@ngvamerica.org.

NGVAmerica Members, Clean City Stakeholders Visit Capitol Hill

On Tuesday, clean transportation leaders as well as numerous Clean Cities coordinators and stakeholders from across the nation were in Washington, D.C., to educate federal policymakers about the need to expand America's use of alternative fuels. On the following day, NGVAmerica members met with their Members of Congress to discuss the need for an extension of the fuel and infrastructure credits and the need to expand our use of natural gas as a transportation fuel. The meetings were especially timely as the Senate Finance committee was considering legislation to extend expired tax credits the following day (See previous article). NGVAmerica members were in town for their spring board meeting, while the Clean Cities coordinators and their stakeholders were in town to attend the Transportation Energy Partners-organized Energy Independence Summit. During the summit participants were given the opportunity to interact with top administration officials—including a keynote address by EPA Administrator Gina McCarthy and leaders from the federal Departments of Energy, Defense, and Transportation, as well as from numerous NGVAmerica sponsoring organizations. A combined total over 240 Congressional offices were visited about the need for an extension of the alternative fuel and infrastructure credits as well as the ongoing need for federal support for alternatives to petroleum-based fuels. NGVAmerica wishes to express its gratitude to all the participants for taking the time out of their busy schedules to visit with their Members of Congress. For more information, contact Paul Kerkhoven at 202.824.7363 or pkerkhoven@ngvamerica.org.

NRC Report on Next Phase of Fuel Economy and GHG Reductions

On Friday, the National Research Council (NRC) released a report that offers insight into ways that NHTSA and EPA can improve upon the current fuel economy and greenhouse gas (GHG) regulations for medium and heavy duty vehicles. The report, *Reducing the Fuel Consumption and Greenhouse Gas Emissions of Medium- and Heavy-Duty Vehicles, Phase Two: First Report,* was published by the National Academy of Sciences. The report devotes a great deal of attention to the potential benefits of NGVs, and includes specific recommendations on the ways future regulations can better accommodate NGVs.

One recommendation is that the agencies should establish a separate standard for NGVs along the lines of the current ones for gasoline and diesel vehicles. Regulations in place today provide different levels of emissions control and sometimes different phase-in periods for gasoline and diesel fueled engines and vehicles. Under the EPA and NHTSA

regulations, NGVs can fall under the gasoline regulations or the diesel regulations depending on whether the natural gas engine was derived from a base gasoline or diesel engine. The latest regulations also provide some flexibility, allowing manufacturers of heavy duty natural gas engines to choose which designation to use but, once a category is established, the natural gas engine must meet all of the requirements set out for the particular engine-type, including meeting criteria pollutant emissions (e.g., NOx, PM) for that engine category. Requirements that are specific to gasoline or diesel engines may not in some cases be appropriate for natural gas. If NGVs were to be regulated separately, EPA and NHTSA could fashion rules based on what is technologically and economically feasible for natural gas.

A second recommendations specific to natural gas include modifying the Greenhouse Emissions Model (GEM) to specifically include examples of natural gas engine types. GEM is used by manufacturers to demonstrate compliance with the standards, but to date it does not include any inputs for natural gas. A third recommendation (this one made with respect to other fuels – not just natural gas) is to include an assessment of upstream emissions in order to ensure that any benefits provided by tailpipe emissions or fuel economy performance are not otherwise negated by upstream emissions.

The report recommends that the government and private entities should support technical improvements to natural gas engine efficiency as well as cost reductions to storage systems and emissions controls in order to better take advantage of the greenhouse gas and petroleum reduction potential of natural gas. There also is a recommendation that EPA and NHTSA evaluate the need for and potential benefits and costs of setting an in-use fuel specification for natural gas. The chapter on natural gas devotes much attention to discussing the economic benefits of natural gas, its lower greenhouse gas emissions potential, and the challenges facing the use of natural gas as a transportation fuel.

The report otherwise spends a lot of time talking about the shortcomings of the Greenhouse Emissions Model and the need for real-world data to help regulators establish baseline fuel economy and emissions in order to guide an assessment of progress that is being made.

The full report is available at: http://www.nas.edu. For more information, contact Jeff Clarke at 202.824.7364 or jclarke@NGVAmerica.org.

State Legislative Update: Another Busy Week for NGV Initiatives

This week, it was Nebraska, Mississippi and Washington making changes to the taxation of natural gas. In Nebraska, LB 867 changes the state excise tax so that it is now imposed

per GGE for CNG and per DGE for LNG. The change becomes effective January 1, 2015. LB 867 also exempts natural gas that is used to compress or liquefy natural gas for transportation from sales and use taxes. Further, the utility gross receipts taxes normally imposed on natural gas will not apply through Jan. 1, 2020 to natural gas that is sold for transportation purposes.

In Mississippi, HB 1590 amends the motor fuel tax so that LNG is now taxed on a DGE basis at a rate of 18 cents. LNG vehicles also will no longer be required to comply with the states decal program. The changes are effective starting in 2015. In Washington, SB 6440 amends the motor fuel tax so that it no longer covers CNG or LNG. Both fuels instead will be covered by the decal program. Washington's excise tax was not beneficial so this change may be a temporary improvement. Other changes impact utility taxes and limit the price that utilities may charge marine users of natural gas.

In Georgia, new incentives are included in HB 348, which was signed into law on April 4. The new law provides tax credits for medium and heavy duty alternative fuel vehicles. The tax credits are limited to dedicated NGVs and vehicles that use at least 90 percent natural gas. The maximum value of the credits is as follows: $12,000 for vehicles weighing 8,501–26,000 lbs. GVWR, and $20,000 for vehicles at 26,001 lbs. GVWR and up. The credits are capped at $2.5 million per fiscal year and there is a per company limit of $250,000 per year. The incentives are in place from July 1, 2015 to June 30, 2017.

Other important bills enacted:

- New York: AB 8559 extends the excise tax exemption for natural gas and other fuels until Sept. 30, 2016
- Utah: HB 61 includes new grant incentives for heavy duty on-road vehicles as well as non-road vehicles and equipment
- Utah: HB 74 expands tax credits currently available for new vehicles or conversions to include leased vehicles

For more information, please contact Jeff Clarke at 202.824.7364 or jclarke@ngvamerica.org.

NGV Market Engagement Encouraged at Illinois Municipal Utility Gathering

On Friday, NGVAmerica made the case for NGV market engagement at the Illinois Public Energy Agency (IPEA) Annual Conference in Effingham, Illinois. IPEA represents small- to medium-sized municipal gas distribution companies in the state. Stephe Yborra presented an NGV overview including market metrics, trends and

projections, and then presented the case for NGV adoption by fleets, suggesting ways IPEA members might work together to engage businesses that operate throughout the state. Following Stephe's mini-workshop, Argonne National Laboratory's Marcy Rood Werpy and St. Louis Clean Cities Coalition's Kevin Herdler briefly outlined grants, rebates and other assistance available through the Illinois EPA's Green Fleets Program and the state's Department of Commerce and Economic Opportunity's Alternative Fuel Research and Infrastructure Grant Program.

More information about IEPA's Green Fleets Program is available at www.illinoisgreenfleets.org, or you may contact Darwin Burkhart at 217.557.1441or darwin.burkhart@illinois.gov. More information about Illinois DCEO's Infrastructure grants program is available at http://www.illinois.gov/dceo/. Information about other states' grants and incentive programs is also available via the Policy Portal located on NGVAmerica's access-controlled Members Center using your membership password. For additional information about this and other NGVAmerica outreach activities, contact Stephe Yborra (syborra@ngvamerica.org or 301.829.2520) or Tom Sheehan (tsheehan@ngvamerica.org or 207.925.1136).

CVEF CNG Critical Issues Workshop Reminder

The Clean Vehicle Education Foundation's (CVEF) Technology Committee has announced a CNG Critical Issues Workshop to be held June 23-24, 2014 at the National Renewable Energy Laboratory (NREL) in Golden, Colorado. The workshop will address a set of technology issues critical to the continued safe deployment of NGVs and associated infrastructure. A maximum of eight topics will be discussed on day one. The last half day will focus on developing action items and position papers as needed. A briefing document on each issue will be prepared prior to the meeting for review. Also participants will be asked to prepare short presentations in support of, in opposition to or stating alternative positions for their topic of interest.

Examples of the issues that may be included are:

- Ventilation of maintenance facilities—review of CVEF/Sandia report
- Unintended consequences from burst disc PRD use
- Proper placement and venting of PRDs
- Design changes for cylinder valves for safe removal
- Dispensing technology to prevent over pressure fills and achieve more effective filling in warm conditions
- Communication fills and on-board pressure management for vehicles
- Reliability/monitoring of solenoid and excess flow valves on containers
- The CNG cylinder/valve/PRD as a system vs. independent sourcing

CVEF is requesting the participants and other industry stakeholders suggest additional topics that may need to be considered in the workshop. Attendance for the one and one-half day workshop will be by invitation and limited to thirty participants. Depending on attendance by the Technology Committee members, an additional five to ten slots may be available. Interested parties should contact John Dimmick at jdimmick.cvef@gmail.com or Doug Horne at dbhorne1@comcast.net.

Wrightspeed Delivers Natural Gas Turbine-Electric Vehicles to FedEx

On Monday, Wrightspeed announced delivery of its turbine-electric medium duty Route system to its first customer, FedEx. The Route is a "repower" powertrain system that replaces a truck's diesel engine, transmission and differential. The Route's electric drive, which also can be plugged in, employs a turbine generator to charge batteries as needed on the road and can run on natural gas or traditional liquid fuels. FedEx has deployed both CNG and diesel versions of Wrightspeed's technology. Both versions significantly surpass California Air Resources Board's emissions standards. "We tend to think of pure battery electric vehicles as the cleanest vehicle technology available, and that used to be true," says Wrightspeed marketing manager, [redacted] "However, our onboard generator burns cleaner per kWh than the average mix of U.S. electric power plants, making Wrightspeed's products cleaner than an EV."

Altech-Eco Receives EPA Cert. for 2015 Ford F-250/350 6.2L Engine

Altech-Eco has received EPA certification for its bi-fuel and dedicated system for 2015 Ford F-250 and F-350 6.2L Engine. Altech-Eco offers in-the-bed tank configurations in 13.6 GGE and 21.2 GGE sizes for the F-250 and F-350 models. As a Ford QVM, Altech-Eco's systems enjoy the same 80,000 Miles/8 Year Emissions Components Warranty. For more information, visit www.altecheco.com/pages/f250.html or contact Miles George at miles@transecoenergy.com.

Clean Energy Opens Three CNG Stations, Signs Fueling Agreements

On Tuesday, Clean Energy announced fueling has begun at its Amarillo, Texas, and Oklahoma City, Oklahoma, America's Natural Gas Highway (ANGH) stations to serve UPS' growing heavy duty LNG truck fleet. UPS deployed six heavy duty LNG-powered trucks that will fuel at the Oklahoma City station, and an addition four trucks will also begin fueling at this location in the coming weeks. These tractors are expected to consume approximately 300,000 DGE of LNG per year. Ten LNG trucks have begun fueling at the Amarillo station under its previously announced bulk fueling agreement.

Clean Energy also announced two fueling agreements with Dillon Transport, a Tennessee-based truckload carrier, and carrier EJ Madison, a Texas-based transportation and logistics company. EJ Madison deployed a fleet of 20 long-haul dual-fuel LNG trucks on routes spanning Clean Energy's ANGH network. EJ Madison intends to expand this fleet with an additional 30 dual-fuel LNG trucks in the coming months. The vehicle conversions are being done by Clean Fuel Technologies in El Paso, Texas. Once fully deployed, the fleet is expected to consume approximately 336,000 DGE of LNG per year. Dillon Transport, a long-time customer of Clean Energy, has deployed an additional eight CNG trucks and signed a fueling agreement to fuel at Clean Energy's Fair Oaks Dairy station in Indiana. The fleet will be hauling raw materials for Owens Corning and is expected to consume approximately 240,000 DGE of CNG per year.

Also this week, Clean Energy announced fueling has begun at its newest publically accessible CNG station located at JFK International Airport within the newly-opened JFK multi-fuel travel plaza. The new station will service a variety of fleet vehicles, including heavy and medium duty trucks as well as shuttles and taxis that service the airport. Ferrara Brothers Building Materials will fuel some of its ready-mix concrete mixers at the new station, as will the New York Department of Sanitation's municipal refuse fleet. The travel plaza is open 24/7 and accepts credit cards and fleet fuel cards. Other alternative fuels available include E-85, EV charging stations, as well as conventional gasoline and diesel. Clean Energy is now operating at every international airport in the Northeast and currently operates over thirty public stations in the Tri-State area.

In addition, Clean Energy announced this week that it has commenced production and sales of "Redeem" (biomethane) fuel at its Memphis biomethane plant. The facility is located at the Republic Services' North Shelby landfill outside of Memphis. The facility is forecasted to achieve an annual production rate of approximately 3.7 million GGE of Redeem once fully operational. For more information, contact Patric Rayburn at patric.rayburn@cleanenergyfuels.com or 949.437.1411.

Freedom CNG Opens Fueling Station in Houston

Freedom CNG, a provider of natural gas fueling infrastructure for high-volume users in the Houston Metropolitan Area, has celebrated the grand opening of a new public fast-fill CNG fueling station in Houston. The station features three dispensers, which will service both commercial and public vehicles. The canopy and other aspects of the station were built to accommodate heavy-duty fleet vehicles. The station was designed around two 250 horsepower compressors capable of delivering approximately 1,500 GGE per hour. "Freedom CNG's vision for the future is to provide enough truck friendly fast-fill CNG fueling stations in the Houston area for fleets to have the confidence to adopt CNG as

their fuel of choice," said Bill Winters. Freedom CNG plans to add an addition 10 fueling stations to the greater Houston area. For more information, visit www.freedom-cng.com or contact John Athon at 713.725.6353 or john@freedom-cng.com.

Chevy Dealership Opens CNG Station in Dallas

On Tuesday, Chevy dealership Classic Chevrolet opened a CNG fueling station Dallas, Texas. The Classic Clean Fuels station will serve both fleets and consumers. The station is located in the Thompson Group Commercial & Fleet building parking lot. The Thompson Group will serve as the anchor fleet for the station.

Freight Liner Starts Production of Cascadia Natural Gas Sleeper

Freightliner Trucks has started production of additional features for the Freightliner Cascadia natural gas-powered tractor. The Cascadia natural gas tractor is now available with a 48-inch sleeper cab, and factory-installed CNG fuel tanks. The Meritor WABCO OnGuard Collision Safety System is also now available on Cascadia natural gas-powered tractors spec'd with a manual transmission. The Cascadia is equipped with the Cummins Westport ISX12 G engine, and it features a variety of CNG fuel tank configurations and up to 190 DGE capacity with an anticipated fill-range of about 800 miles. The Cascadia natural gas sleeper has a roomy and comfortable cab with driver-friendly features, as well as the latest aerodynamic elements to further enhance overall performance. For more information, visit www.FreightlinerTrucks.com.

Chart Unveils Larger Capacity LNG Fuel System

Chart Industries has made available a new bonus capacity LNG vehicle system. The new system maximizes the volumetric efficiency of the LNG fuel tank by six percent for the 2015 model year. This bonus capacity option is available on 26 inch diameter horizontal vehicle tanks—the industry standard size. While the size of the external tank remains the same, the internal tank capacity has been increased to extend vehicle range.

Ryder's Natural Gas Fleet Surpasses 20 Million Miles

Ryder Systems has announced that its fleet of over 500 NGVs has now surpassed 20 million miles. The fleet consists of LNG and CNG tractors serving over 40 customer operations in California, New York, Texas, Arizona, Michigan, Utah, Georgia and Louisiana. Since deploying its NGV program in 2011, Ryder has replaced approximately 3.1 million gallons of diesel fuel. In 2013, Ryder opened its first natural gas fueling stations to serve both the general public and Ryder lease and rental customers. Ryder's LCNG stations are located at two maintenance and fueling facilities in Orange and

Fontana, California. In addition to making NGVs available for rent or lease, Ryder's "Flex-to-Green Lease" solution is designed to ease the transition to a greener fleet. Businesses that opt for Ryder's Flex-to-Green Lease start out with a diesel-powered vehicle and then have the option to convert to an NGV at any time following the first full year of the lease.

New Company Sparq to Promote the Use of CNG in Transportation

Three members of the former Chesapeake Energy Corp. CNG vehicle team have launched Sparq Natural Gas, LLC, a new initiative aimed at promoting the use of CNG as a vehicle fuel. Based in Oklahoma, Sparq will partner with existing convenience stores and will act as a consultant to companies considering entering or expanding into the CNG business. CEO Norman Herrera explained Sparq's team, including Chief Financial Officer Tristan Adler and Chief Operating Officer Sufyan Qarni, wanted to introduce an NGV business founded on the objective of regional infrastructure development supported by national consulting and advisory services.

New Report Highlights Benefits of LNG in Canada's Marine Sector

The Steering Committee of Canada's West Coast Marine LNG Joint Industry Project has released a report highlighting the benefits of using LNG for Canada's marine sector. According to the report, *Liquefied Natural Gas: A Marine Fuel for Canada's West Coast*, all of the technologies needed to use LNG as a marine fuel are proven and commercially available. "Allowing access for LNG in the marine sector is smart and strategic for Canada," said Alicia Milner, President of the Canadian Natural Gas Vehicle Alliance (CNGVA) and Chair of the project steering committee. "British Columbia is uniquely positioned to become a preferred North American destination for LNG bunkering." In the near-term, coastal vessel operators have the best opportunity to benefit from LNG. For six coastal vessels analyzed, fuel costs were reduced by more than 50 percent with five of the ships having a payback on initial investment of less than six years. New marine regulations taking effect in January 2015 require a 90 percent reduction in fuel sulfur content. Compared to traditional marine fuels, LNG use can reduce sulfur emissions by at least 90 percent, lower nitrogen oxide emissions by 35 percent or more, decrease particulate matter by at least 85 percent and reduce greenhouse gas emissions by up to 19 percent. Jointly funded by Transport Canada and a broad group of industry and other participants, the report recommends changes to Canada's marine regulatory framework to allow for the review and approval of new LNG projects. These changes would support new projects moving forward, including the use of three LNG ferries that BC Ferries plans to have in operation in 2017.

The NGVAmerica newsletter is an NGVAmerica member benefit and should only be distributed to members of NGVAmerica. Redistribution to nonmembers is strictly prohibited. For more information, contact Rich Kolodziej at 202.824.7366 or rkoodziej@ngvamerica.org.

For comments on the content of this newsletter or for mailing list changes, contact Rich Kolodziej at rkolodziej@NGVAmerica.org.

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One_dead_after_natural_gas_truck_explodes_in_Howard (thenorthwestern.com)

One dead after natural gas truck explodes in Howard (video, story)

Written by Nathan Phelps Press-Gazette Media
Apr. 4, 2014 |

thenorthwestern.com

One person was killed after the truck he was driving exploded Thursday on Pamperin Road in Howard. / H. Marc Larson/Press-Gazette Media

Zoom

One person was killed after the truck he was driving exploded Thursday on Pamperin Road in Howard. / H. Marc Larson/Press-Gazette Media

HOWARD — A truck driver was killed and another man was critically injured Thursday when a truck's fuel system exploded near an industrial park, officials said.

Ed Janke, public safety director of the village of Howard, said the explosion — reported around 1:30 p.m. — appears to be the result of a shifting load compromising the truck's fuel system.The Brown County Sheriff's Office said the truck had slowed for a turn when the its load of heavy equipment moved forward and penetrated the truck's compressed natural gas fuel system, causing it to explode."The truck slowed to turn into a driveway and the load shifted inside, apparently, and that compromised the compressed natural gas fuel system on the truck," Janke said. "The fuel system subsequently detonated."The male driver was pronounced dead at the scene and a male passenger was thrown from the cab and transported to a hospital with what are described as critical injuries, the Brown County Sheriff's Office said in a written statement.About an hour after the original report, the truck's cab sat cocked forward on its chassis near the corner of Pamperin and Cornell roads in the Howard Industrial Park. Crews remained on the scene into late afternoon.Several businesses in the area were evacuated as a precaution, but Janke said later that people have been allowed to return to work.The truck is owned by Ace Manufacturing Industries Inc., which is located on Pamperin Drive. It was operating between two Ace Manufacturing Industries Inc. facilities in the area, Janke said."This is the first time I have seen the catastrophic release of a compressed fuel system like that," Janke said. "We were very concerned about additional explosions. We weren't sure what caused the original explosion, so we created a safe area."Ace Manufacturing issued a statement from co-owners [redacted] and [redacted] regarding the incident:"First and foremost, our thoughts and prayers go out to the family of the truck driver who lost his life in this accident, as well as another worker who was injured. For privacy reasons, we are not releasing the names of those involved. We are a small and close-knit company and this has shaken and saddened all of us."A hazardous material team was called to the scene, evaluated the area for any danger and determined no threat remained. The Brown County Sheriff's Department is investigating the incident.A number of people at the scene talked about how they heard a loud boom

and followed the firefighters to see the source of the noise."I was just sitting watching a baseball game and I heard a big ka-boom," said [redacted], who lives about a mile from the scene. "I knew it wasn't thunder. I didn't know what the heck it was."It was a big boom. It was loud enough it made my heart shudder."Pamperin Road between Velp Avenue and Cornell Road was expected to stay closed for several hours on Thursday while the investigation continues, according to the sheriff's office.—nphelps@pressgazettemedia.com and follow him on Twitter@nathanphelpsPG

PE14-020

11-4-2014

DATA TO ODI

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INDIANA UNIVERSITY

TRANSPORTATION RESEARCH CENTER

ON-SITE COMPRESSED NATURAL GAS VEHICLE EXPLOSION INVESTIGATION

FOR THE OFFICE OF DEFECTS INVESTIGATION (ODI)
CASE NUMBER - [redacted]
LOCATION - WISCONSIN
VEHICLE - 2014 FREIGHTLINER M2 112
INCIDENT DATE - April 2014

Contract Number: [redacted]

Prepared for:

U.S. Department of Transportation
National Highway Traffic Safety Administration
National Center for Statistics and Analysis
Washington, D.C. 20590-0003

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The opinions, findings, and conclusions expressed in this publication are those of the authors and not necessarily those of the National Highway Traffic Safety Administration.

The crash investigation process is an inexact science which requires that physical evidence such as skid marks, vehicular damage measurements, and occupant contact points be coupled with the investigator's expert knowledge and experience of vehicle dynamics and occupant kinematics in order to determine the pre-crash, crash, and post-crash movements of involved vehicles and occupants.

Because each crash is a unique sequence of events, generalized conclusions cannot be made concerning the crashworthiness performance of the involved vehicle(s) or their safety systems.

Technical Report Documentation Page

1. Report No. [redacted]	2. Government Accession No.	3. Recipient's Catalog No.
4. Title and Subtitle On-Site Compressed Natural Gas Vehicle Explosion Investigation Vehicle - 2014 Freightliner M2 112 Location - Wisconsin		5. Report Date: August 2014 6. Performing Organization Code
7. Author(s) Special Crash Investigations Team 2		8. Performing Organization Report No.
9. Performing Organization Name and Address Transportation Research Center Indiana University 501 South Madison Street, Suite 105 Bloomington, Indiana 47403-2452		10. Work Unit No. (TRAIS) 11. Contract or Grant No. [redacted]
12. Sponsoring Agency Name and Address U.S. Department of Transportation (NVS-411) National Highway Traffic Safety Administration National Center for Statistics and Analysis Washington, D.C. 20590-0003		13. Type of Report and Period Covered Technical Report Crash Date: April 2014 14. Sponsoring Agency Code

15. Supplementary Notes

On-site compressed natural gas vehicle explosion investigation involving a 2014 Freightliner M2 112.

16. Abstract

This on-site investigation focused on the Compressed Natural Gas (CNG) fuel system of a 2014 Freightliner M2 112. One of the vehicle's five CNG fuel cylinders was punctured by the left fork of an unsecured Yale Type E forklift located in the cargo box of the Freightliner, resulting in an explosion of the fuel cylinder. There was no fire. This incident occurred on a two-lane roadway in an industrial park. The Freightliner was a two-door straight truck equipped with a CNG fuel system, consisting of five CNG fuel cylinders stacked vertically and secured within an aluminum cabinet located between the truck cab and cargo box. The cylinders had been filled the previous evening and the truck was used in the morning on the day of the incident. While the specific fill level of the CNG tanks is not known, it was reported by an investigator from the Clean Vehicle Education Foundation that the CNG cylinders were nearly full at the time of the incident. A restrained [redacted]-year-old male driver and a restrained [redacted]-year-old male front right passenger occupied the vehicle. The Freightliner was traveling east and was transporting an unsecured Yale Type E forklift. The Freightliner's driver was braking to initiate a right turn into a driveway when the forklift was displaced forward as a result of the deceleration and the forks impacted and pierced the front panel of the cargo box. The left fork then impacted and ruptured the lowest of the five CNG fuel cylinders resulting in a explosion. The driver sustained fatal injuries and expired at the scene. The front right passenger sustained police reported "A" (incapacitating) injuries and was transported by ambulance to a hospital where he was admitted for one day.

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INDIANA UNIVERSITY

TRANSPORTATION RESEARCH CENTER
ON-SITE COMPRESSED NATURAL GAS VEHICLE EXPLOSION INVESTIGATION

FOR THE OFFICE OF DEFECTS INVESTIGATION (ODI)
CASE NUMBER - [redacted]
LOCATION - WISCONSIN
VEHICLE - 2014 FREIGHTLINER M2 112
CRASH DATE - April 2014

BACKGROUND

This on-site investigation focused on the Compressed Natural Gas (CNG) fuel system of a 2014 Freightliner M2 112 (**Figure 1**). One of the five CNG fuel cylinders was punctured by the left fork of an unsecured Yale Type E forklift located in the cargo box of the Freightliner resulting in a explosion of the fuel cylinder. There was no fire. This investigation was initiated by the National Highway Traffic Safety Administration (NHTSA) on April 15, 2014 through the Office of Defects Investigation (ODI), which was responding to an on-line news article. This investigation was assigned on April 17, 2014 when cooperation to inspect the Freightliner was finalized with the vehicle's owner. The incident involved the Freightliner and the Yale Type E forklift located within the cargo box of the vehicle. This incident occurred in April 2014 at 1335 hours, in Wisconsin and was investigated by a local police agency. The Freightliner and incident scene were inspected on April 22, 2014. Interviews with the front right passenger of the Freightliner, the owner of the Freightliner, and the city public safety director were also conducted on April 22, 2014.

Figure 1: On-scene police photograph of the damaged 2014 Freightliner M2 112

This incident occurred on a two-lane roadway in an industrial park. The Freightliner was a two-door straight truck equipped with a CNG fuel system, consisting of five CNG fuel cylinders oriented horizontally and stacked vertically within an aluminum cabinet located between the truck cab and cargo box. The cylinders had been filled the previous evening and the truck was used in the morning on the day of the incident. The fill level of the CNG tanks could not be determined. A restrained [redacted]-year-old male driver and a restrained [redacted]-year-old male front right passenger occupied the vehicle. The Freightliner was traveling east and was transporting an unsecured Yale Type E forklift. The Freightliner's driver was braking to initiate a right turn into a driveway when the forklift was displaced forward as a result of the deceleration and the forks impacted and pierced the front panel of the cargo box. The left fork then impacted and ruptured the lowest of the five CNG fuel cylinders resulting in a explosion. There was no fire. The driver sustained fatal injuries and expired at the scene. The front right passenger sustained police reported "A" (incapacitating) injuries and was transported by ambulance to a hospital where he was admitted for one day.

Incident Site: This incident occurred during daytime hours on a two-lane roadway in an industrial park. The weather conditions were clear with 10 mile visibility, northeasterly winds at 27 km/h (17 mph), a temperature of 0.6° C (33° F), and dew point of -2° C (28° F), according to local weather reports. The bituminous roadway traversed in an east-west direction and had one through lane in each direction that were bordered by gravel shoulders approximately 2 m (6.5 ft) in width. The eastbound lane was 3.5 m (11.5 ft) wide and the westbound lane was 4 m (13.1 ft) wide. The roadway pavement markings consisted of a broken yellow center line. The roadway was level and the speed limit was 56 km/h (35 mph). The Incident Diagram is included on page 13 of this report.

Pre-Incident: The forklift was driven into the Freightliner's cargo box at a factory loading dock by the driver of the Freightliner, and the forks were lowered to the floor of the cargo box. It was reported in the police reconstruction report that the forklift's shift lever was placed in neutral and the parking brake was set. The forklift was not secured with straps nor were the wheels blocked. It was also reported in the police reconstruction report that, based on information from representatives of a local Yale forklift dealer, the parking brake was designed only to hold the forklift in place on a ≤15% grade. It was not designed to prevent the forklift from rolling during transport. The forklift's specific location within the cargo box is unknown, since only the driver of the Freightliner was involved in loading it onto the truck and he sustained fatal injuries during the incident. The driver of the Freightliner intended to travel from the loading dock to the street, turn right, and travel to a second building located approximately 500 m (1,640 ft) from the loading dock where the driver and right passenger would deliver the forklift and pick up a table. The Freightliner was traveling east in the right lane approaching the driveway to the second building (**Figure 2**) at a travel speed, estimated by the right passenger, of 40 km/h (25 mph). The passenger stated during the SCI interview that he and the driver were conversing, and it was necessary for him to alert the driver that they were approaching the driveway to their destination. He further stated the driver then pumped the brakes to reduce the Freightliner's speed.

Figure 2: Freightliner's eastbound approach to the driveway (on right) and area of explosion

Incident: The unsecured forklift traveled forward in the cargo box as the driver braked. The front forks pierced the front panel of the cargo box and the left fork impacted the lowest of five CNG fuel cylinders that were oriented horizontally and stacked vertically within an aluminum cabinet located between the truck cab and cargo box. The impact site on the CNG cylinder was located 65 cm (25.6 in) left of the right cylinder end. This impact resulted in a rupture and explosion of the cylinder. There was no fire. The Freightliner's air lines were severed and the wheels locked, leaving police-reported skid marks that ranged from 4.3 - 7.44 m (14.1 - 24.4 ft) in length as the vehicle skidded to final rest, heading southeast. A speed to skid to a stop calculation based on the longest skid mark length and a deceleration value range[1] of 0.41 - 0.56 g yielded a speed range at the onset of the skid

[1] Traffic Accident Reconstruction, Volume 2 of The Traffic Accident Investigation Manual by Lynn B. Fricke, Northwestern University Traffic Institute, 1990

of 27.8 km/h (17.3 mph) - 32.5 km/h (20.2 mph). The force of the explosion resulted in severe damage to the frame, undercarriage, cargo box, fuel cabinet, CNG cylinders, and cab of the Freightliner.

Post-Incident: The police were notified of the incident at 1336 hours and arrived on scene at 1342 hours. Fire, rescue, and medical personnel responded to the incident. The front right passenger of the Freightliner stated during the interview that he checked on the driver and attempted to awake him from unconsciousness but was unsuccessful. He noticed the smell of natural gas and climbed out of the right front window which had disintegrated from the explosion. The driver of the Freightliner sustained fatal injuries and expired at the scene. The front right passenger sustained police reported "A" (incapacitating) injuries and was transported by ambulance to a hospital where he was admitted for two days. The Freightliner was towed from the incident scene due to damage.

2014 FREIGHTLINER M2 112

DESCRIPTION

The Freightliner was a rear wheel drive, 6 x 4, two-passenger, straight truck (VIN: 1FVHC5DX9EHxxxxxx) that was manufactured in August 2013 and was equipped with an 8.9-liter I-6 engine powered by compressed natural gas, a ten-speed automatic transmission, four-wheel anti-lock brakes, and a 6.1 m (20 ft) long cargo box. The windshield glazing was AS1 laminated and the left, right, and backlight glazings were AS2 tempered. The glazing for all non-fixed windows were closed at the time of the incident. The specified wheelbase was 472 cm (186 in).

The vehicle manufacturer's recommended tire size was 295/75R22.5 The vehicle was equipped with tires sized 295/75R22.5 and 275/80R22.5 on the front and rear wheels, respectively. The manufacturer's recommended cold tire pressure for the front and rear tires was 758 kPa (110 psi).

The vehicle was equipped with driver and right passenger cloth-covered, box-mount bucket seats with integral head restraints.

EXTERIOR DAMAGE

Frame and Undercarriage: The explosion deformed the truck frame directly below the fuel cylinder cabinet (**Figure 3**). Both frame rails were bent, as were the frame cross members fore and aft of the cylinder cabinet. The center section of the drive shaft was fractured and separated from the transmission. The air brake lines were severed and the air brake tank was also slightly displaced. The rear engine mounts were undamaged.

Figure 3: Freightliner's undercarriage damage directly under fuel cabinet

Passenger Cab: The cab of the truck was heavily damaged from the explosion (**Figure 4**). The most

severe damage occurred below and behind the driver's seat . The entire cab was displaced upward and forward approximately 40 cm (15.7 in) and the back panel of the cab was torn vertically, intruding into the passenger area. Shards of carbon fiber wrap and fiberglass from the ruptured cylinder were found throughout the inside of the cab and the windshield was holed from the force of the explosion.

Figure 4: Police on-scene photograph of damage to cab of the Freightliner

Cargo Box: The truck's cargo box (**Figure 5**) was also heavily damaged from the explosion. The front panel was largely displaced from the main structure. The roof and rear door panels completely detached and the left side panel was partially detached. There was slight damage to the floor and right side panel.

Figure 5: Police on-scene photograph of damage to the Freightliner's cargo box

Cargo: The only cargo was a Yale Type E battery powered forklift, Model ERP040TFN03739W. The forklift (**Figure 6**) measured 306 cm (120.5 in) from back to fork tips and weighed 4,035 kg (8,896 lb). Each fork was 106 cm (41.7 in) in length and 10 cm (3.9 in) in width. The forks were 1.5 cm (0.5 in) thick at the tips and 4 cm (1.6 in) at the base and were set 49 cm (19.3 in) apart from each other. A parking brake was located on the left side of the instrument panel and was engaged at the time of the incident.

Figure 6: Yale Type E forklift (in cargo box at time of incident)

CNG Cylinder Cabinet Damage

The cabinet for the CNG cylinders was manufactured by Agility Fuel Systems and was located between the cab and cargo box. The cabinet included an aluminum support structure that measured 217 cm (85.4 in) in height and 53 cm (20.9 in) in width, which was encased by aluminum sheeting. There was no protective barrier between the CNG cabinet and the cargo box. The rack allowed for five CNG cylinders to be mounted by the neck, horizontally onto cross members. The cylinders were stacked vertically in the cabinet. The cabinet sustained severe damage as a result of the explosion (**Figure 7**). The sheet metal encasing the cabinet was mostly displaced from the vehicle, with only the forward panel remaining attached. The left rear vertical frame member fractured and separated 88 cm (34.6 in) from the bottom support and the front vertical frame member

was rotated 90 degrees to the left. All cross members, on both sides, were either fractured, displaced, or bent (**Figure 8**).

Figure 7: Left side damage to fuel cabinet

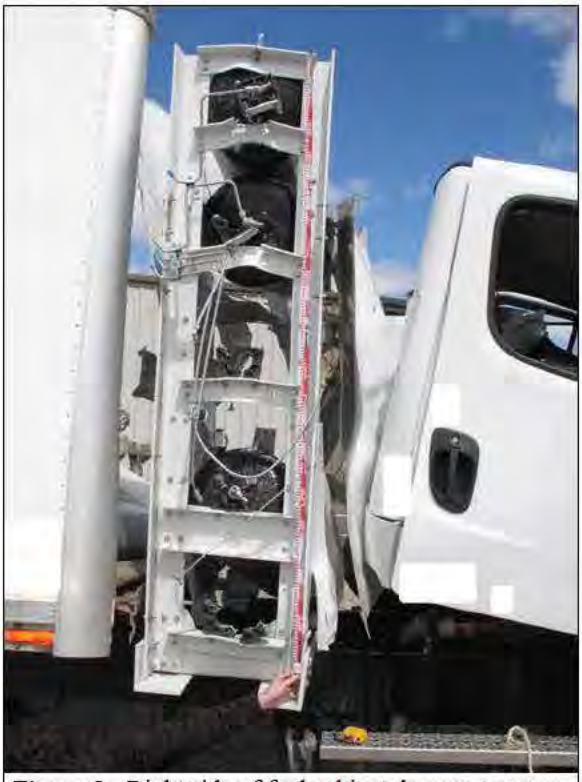


Figure 8: Right side of fuel cabinet damage to cross members

CNG Cylinders and Damage

The five CNG cylinders were Type 4 design (polymer liner with carbon fiber and fiberglass overwrap), manufactured by Hexagon Lincoln, Model number RH36A16-07601. Each cylinder measured 205 cm (80.6 in) in length, 41 cm (16 in) in diameter, and were certified with ANSI NGV2 and FMVSS 304. Each cylinder was equipped with a Pressure Relief Device (PRD) at each end, which was designed to pipe discharge away to the top of the cabinet in the event of a breach of the system. Each cylinder had a manual valve without an excess flow device that was manufactured by OMB. The bottom cylinder (cylinder 1) was impacted by the left fork of the forklift and ruptured (**Figure 9**), with the damage starting 65 cm (25.6 in) left of the right end of the cylinder. A 66 cm (26 in) section of the left end of the cylinder (**Figure 10**) separated and was displaced into the street (**Figure 11**). Both valves separated from the bottom cylinder. Cylinder 2 remained intact, but the left side dropped from its mount. The left side valve was detached and part of the right side valve remained in place. Cylinder 3 was propelled out of the cabinet and landed in the street, according

Figure 9: Ruptured CNG cylinder

to incident documents. At least one valve remained attached to the cylinder. Cylinders 4 and 5, at the top of the cabinet, remained in their positions and all valves remained attached.

Figure 10: Displaced section of ruptured CNG cylinder

Figure 11: Police on-scene photograph showing location of displaced section of bottom CNG cylinder (arrow)

Figure 12: Exterior view of intrusion of back wall of Freightliner's cab

Interior Damage

The interior of the Freightliner sustained severe damage from the CNG cylinder explosion. There were a total of twelve intrusions to the passenger compartment. The most severe intrusions occurred in the driver's space and were to the back wall of the cab and the backlight header (**Figures 12** and **13**), which intruded longitudinally approximately 80 cm (31 in), and 30 cm (12 in), respectively, and the floor, which intruded vertically approximately 40 cm (16 in). The driver was projected forward by the explosion and he loaded the steering assembly (**Figure 13**), displacing it forward approximately 25 cm (10 in). Scuff marks were noted on the roof above the driver's seat, possibly from contact by the driver's head. The rearview mirror was also displaced from possible contact by the driver's right hand. Fragments of fiber glass from the ruptured CNG tank were also deposited throughout the cab. Some of the fragments cut the ceiling upholstery in the front right passenger's space, and fragments were embedded in the roof and damaged a plastic storage compartment in this area. Both doors were jammed shut and the left door was mechanically pried open by rescue personnel. The windshield was in place and holed due to explosion forces. The right and left glazings as well as the backlight all disintegrated due to the explosion. The only undamaged glazings were the small windows on each door.

Manual Restraint Systems

The front seating positions were equipped with lap and shoulder safety belts with fixed upper anchors.

The driver was restrained by the lap and shoulder safety belt based on the police-reported statement of a witness who was one of the first to arrive at the vehicle immediately following the

incident. The front right passenger stated during the interview that he was restrained by the lap and shoulder safety belt. He sustained a contusion across his chest consistent with safety belt usage. Inspection of both safety belt assemblies revealed evidence of historical usage, but no discernable evidence of loading was found.

Figure 13: Intrusion of the back wall of the Freightliner's cab and displacement of the steering column from driver contact

CNG Fuel System Inspection by Other Party

The Freightliner and its fuel system were inspected by the Director of Technology for the Clean Vehicle Education Foundation. A summary of findings from his preliminary report[2] relative to the CNG fuel system are as follows:

1. The neck mounts on all five cylinders were broken by the pressure wave and there were many fractures of the aluminum supporting structure.

2. The right front vertical member of the supporting structure was bent into a radius, apparently by the rupturing cylinder when it was propelled forward and to the right by the escaping gas.

3. All of the high-pressure CNG from the system escaped through the broken cylinder connections in about ten minutes following the arrival of the first responders. There was no ignition and no fire.

4. The composite fracture apparently progressed approximately in a longitudinal direction and then turned and ran circumferentially, separating one of the cylinder ends and ejecting it from the driver's side of the truck.

5. No existing reports of such low velocity, high momentum and concentrated impacts against fiber reinforced composite pressure vessels have been identified. This impact scenario is unlike either the blunt impacts imposed during the NGV2 drop tests or the high-velocity impact of the NGV2 penetration test (gunfire). The sharpness of the fork tip and its point of impact directly into the cylinder sidewall are also unlike the previous oblique severe impacts of roof-mounted cylinders against overhead obstruction. This is the first rupture incident apparently resulting from impact on a NGV2 cylinder made since the drop impact tests were strengthened in 1998.

6. The pressurized cylinder had enhanced sidewall rigidity because it was nearly full. This rigidity probably prevented general deflection in the sidewall (to an oval shape). This deflection is

[2] The report was obtained from the investigating police agency. There was no prohibition specified in the report regarding the dissemination of the preliminary findings.

considered favorable in reducing impact damage to an empty cylinder. A more compliant, less pressurized cylinder could have deflected and reduced damage at the point of impact.

7. The cylinder was possibly more rigidly attached to the massive truck chassis because it was the bottom cylinder in a framework rigid enough to carry a five-high stack of cylinders. The cylinder thus could not move away from the impact to reduce the damage at the point of impact.

8. The shape of the fork tip probably produced a cut perpendicular to the critical hoop direction reinforcing fibers. These fibers carry the greatest load in a pressure vessel and the orientation of the fork tip was such to maximize the number of hoop fibers that were damaged.

9. If the fork tip penetrated the sidewall of the cylinder it would have wedged the break open because the long taper of the fork. This could have inflicted greater damage than a simple penetration by a 2 mm x 60 mm point.

10. A low impact speed with high momentum may be more damaging to composites than a high velocity impact.

11. Information from tests and other accidents indicate that CNG cylinders resist rupture as a result of more blunt impacts. This may be a more likely damage scenario from general loose cargo. The occupant space in the cab could receive considerable protection from the cylinders and mounting structure.

2014 FREIGHTLINER M2 112 OCCUPANTS

DRIVER DEMOGRAPHICS

Age/Sex:	[redacted]
Height:	
Weight:	
Eyewear:	
Seat Type:	Pedestal
Seat Track Position:	Unknown
Manual Restraint Usage:	Lap and shoulder safety belt
Usage Source:	Witness statement
Air Bags	None
Alcohol/Drug Involvement:	None
Egress from Vehicle:	Removed by emergency responders
Transport from Scene:	Transported from scene for autopsy
Medical Treatment:	None, deceased at scene

DRIVER INJURIES [redacted]

Injury Number	Injury	AIS 2005/08	Injury Source	Confidence Level
1 2	Hemorrhage, subarachnoid over both cerebral hemispheres, not further specified	140693.2,1 140693.2,2	Steering wheel rim	Probable
3	Fracture right orbital plate, not further specified	251200.2,1	Steering wheel rim	Probable
4	Fracture nose with displacement (deformity), not further specified	251002.2,4	Steering wheel rim	Probable
5	Laceration pericardium with residual blood in sac	441602.2,4	Steering wheel hub and/or spokes	Certain
6	Laceration (tear) right and left atria, not further specified	441016.6,4	Steering wheel hub and/or spokes	Certain
7	Laceration (tear), multiple, thoracic aorta, not further specified	420206.4,4	Steering wheel hub and/or spokes	Certain
8	Laceration (rupture) left diaphragm with protrusion of stomach into left chest cavity	440610.4,2	Steering wheel hub and/or spokes	Certain
9	Fractured ribs, multiple, bilaterally, right greater than left	450203.3,3	Steering wheel hub and/or spokes and rim	Certain
10	Contusions bilateral pleural surfaces of lungs, not further specified	441420.3,3	Steering wheel hub and/or spokes	Probable
11	Lacerations bilateral pleural surfaces of lungs with extensive parenchymal hemorrhage	441450.4,3	Steering wheel hub and/or spokes	Certain
12	Hemothoraces, bilaterally, with residual blood in each pleural cavity, not further specified	442200.3,3	Steering wheel hub and/or spokes and rim	Certain
13	Laceration left kidney, not further specified	541620.2,2	Steering wheel rim	Certain
14	Lacerations, multiple, capsule of liver, with internal crush injury of parenchyma, not further specified	541826.4,1	Steering wheel hub and/or spokes and rim	Certain
15	Laceration capsule of spleen with fragmentation of spleen, not further specified	544226.4,2	Steering wheel hub and/or spokes and rim	Certain
16	Fracture, palpable, right shoulder, not further specified	751800.2,1	Seat back, driver's	Probable
17 18	Lacerations (cuts) right side of face from right periorbital area to right chin, not further specified	210602.1,1 210602.1,8	Noncontact injury: flying glass, back light	Probable
19	Lacerations (cuts) right side of neck, not further specified	310602.1,1	Noncontact injury: flying glass, back light	Probable

***Driver Injuries** (Continued)* [redacted]

Injury Number	Injury	AIS 2005/08	Injury Source	Confidence Level
20	Laceration, stellate tear, open wound, right lower quadrant of abdomen, not further specified	510602.1,1	Steering column and/or tilt adjustment lever	Probable
21	Abrasions, multiple, posterior right upper arm from shoulder to elbow	710202.1,1	Noncontact injury: flying glass, back light	Probable
22	Laceration (cut) posterior right arm near elbow	710602.1,1	Noncontact injury: flying glass, back light	Probable
23	Abrasions, multiple, dorsal (posterior) left wrist, not further specified	710202.1,2	Noncontact injury: flying glass, back light	Probable
24	Lacerations, multiple, dorsal (posterior) right hand	710602.1,1	Noncontact injury: flying glass, back light	Probable
25	Abrasions, multiple, on bilateral thighs, not further specified	810202.1,3	Steering wheel rim	Probable
26	Abrasions, multiple, on lower legs, not further specified	810202.1,3	Left lower instrument panel	Certain
27	Contusions, multiple, on proximal bilateral thighs, not further specified	810402.1,3	Steering wheel rim	Probable
28	Contusions, multiple, on lower legs, not further specified	810402.1,3	Left lower instrument panel	Certain
29	Laceration, open, just below and lateral to left knee with foreign material embedded	810602.1,2	Left lower instrument panel	Certain

Source: Autopsy Records.

DRIVER KINEMATICS

The driver was restrained by the lap and shoulder safety belt. He was displaced forward and upward as a result of explosion forces and intrusion of the back wall of the cab. His face and chest loaded the steering assembly causing a subarachnoid hemorrhage, fracture of the right orbital plate and nose, lacerations of the pericardium, right and left atria, thoracic aorta, and diaphragm. He also sustained bilateral fractures of multiple ribs, contusions and lacerations of the lungs, and lacerations of the left kidney, liver, and spleen from contacting the steering assembly. Contact with the seat back caused a fracture of the right shoulder, and he sustained multiple lacerations and abrasions from flying glass from the disintegrated backlight. He also sustained multiple abrasions and contusions to the lower extremities from contacting the lower left instrument panel and steering wheel rim, and an open laceration of the left lower leg, also from contacting the lower left instrument panel. The driver injuries were fatal and he was officially pronounced deceased at 1640 hours.

FRONT RIGHT OCCUPANT DEMOGRAPHICS

[redacted]

Age/Sex: [redacted]
Height:
Weight:
Eyewear:
Seat Type: Pedestal
Seat Track Position: Unknown
Manual Restraint Usage: Lap and shoulder safety belt
Usage Source: Passenger interview and injury data
Air Bags None
Alcohol/Drug Involvement: None
Egress from Vehicle: Exited without assistance through disintegrated right front window
Transport from Scene: Ambulance
Medical Treatment: Hospitalized one day

FRONT RIGHT OCCUPANT INJURIES

Injury Number	Injury	AIS 2005/08	Injury Source	Confidence Level
1	Traumatic (closed) head injury, not further specified, with mild headache	110009.1,0	Noncontact injury: impact (blast) forces	Probable
2	Contusion, acute left lung, left upper lobe, secondary to explosion/blast	441420.3,2	Noncontact injury: impact (blast) forces	Certain
3	Contusion posterior scalp, not further specified	110402.1,6	Seat back, front right passenger's	Probable
4	Laceration, 1.3 cm (0.5 in) in length on right posterior scalp	110602.1,6	Other interior loose object: fiber glass debris	Probable
5	Avulsed (missing) gum tissue from upper right incisor area	243206.1,8	Right instrument panel	Probable
6 7	Abrasions, superficial, to right side of nose and lower lip	210202.1,4 210202.1,8	Right instrument panel	Probable
8	Abrasion across mid chest with bilateral tenderness, not further specified	410202.1,4	Torso portion of safety belt system	Certain
9	Penetrating (puncture) injury back of left shoulder, one near arm pit, one over scapula	716011.1,2	Other interior loose object: fiber glass debris	Certain
10	Laceration, 2.5 cm (1 in), vertically oriented, above right knee	810602.1,1	Right lower instrument panel	Probable
11	Laceration, 2.5 cm (1 in), horizontally oriented, below right knee	810602.1,1	Right lower instrument panel	Probable
12	Abrasion left lower leg, probably left knee, not further specified	810202.1,2	Right lower instrument panel	Probable

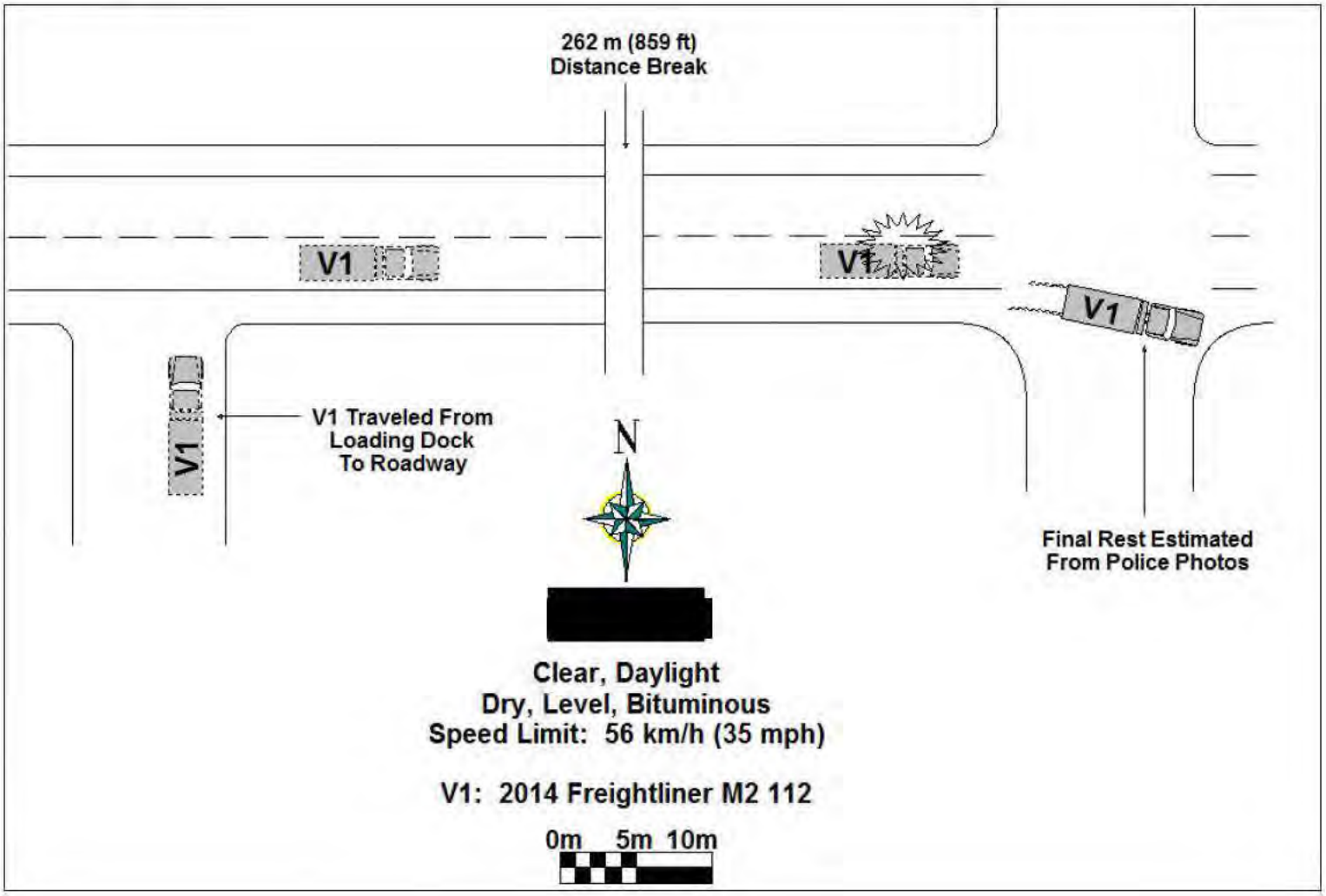
Front Right Occupant Injuries ***(Continued)*** [redacted]

Sources: Emergency Room Records, Hospitalization Records, and Interviewee Data–Same Person. Injury Numbers 4 and 9 through 11 came only from ***Interviewee Data****. Injury Numbers 3, 5, and 12 came only from* ***Emergency Room Records****. Injury Number 8 came only from* ***Hospitalization Records****. Injury Numbers 1 and 2 came from a combination of* ***Emergency Room*** *and* ***Hospitalization Records****. Injury Numbers 6 and 7 came from all three sources.*

FRONT RIGHT OCCUPANT KINEMATICS

The front right passenger was restrained by the lap and shoulder safety belt and was displaced forward as a result of explosion. The blast forces caused a closed head injury and left lung contusion. He loaded the safety belt causing an abrasion across his chest, and contacted his face on the right instrument panel causing an abrasion on the nose and lower lip, and an avulsion of the gum. His lower extremities contacted the right lower instrument panel causing a laceration above and below the right knee and an abrasion on the left knee. He rebounded back into his seat and contacted the back of his head on the seat causing a contusion to the posterior scalp. Flying fiber glass fragments from the exploded CNG cylinder caused two puncture injuries to the back of the left shoulder and a laceration to the back of the head. The front right passenger exited the vehicle without assistance through the disintegrated right side window glazing. He was transported by ambulance to a hospital where he was admitted for one day.

INCIDENT DIAGRAM [redacted]



PE14-020

11-4-2014

DATA TO ODI

NO LETTER

Request No. 5 Data Files

[redacted]

Update - Names released of victims in deadly truck explosion in Howard

PE14-020

11-4-2014

DATA TO ODI

NO LETTER

Request No. 5 Data Files

[redacted]

Update - Names released of victims in deadly truck explosion in Howard

PE14-020

11-4-2014

DATA TO ODI

NO LETTER

Request No. 5 Data Files

[redacted]

[redacted]

[redacted]

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One man was killed, the other was taken to the hospital

UPDATE

HOWARD, Wis[redacted] A truck explosion in Howard this afternoon left one man dead and another critically injured. The blast happened within the Howard Industrial Park early this afternoon and was felt a half-mile away.

Brown County Sheriff says [redacted] from Sobieski was driving the truck and was killed. The passenger, [redacted] was transferred to a local hospital with non-life-threatening injuries.

These are images of the aftermath of that explosion, some sent into Local 5 News by our viewers. The box truck we are told was outfitted with a compressed natural gas fuel system and was carrying a load of heavy equipment.

According to police around 1:30 this afternoon, the truck was transporting products between two Ace warehouses located on Pamperin Road, when this happened.

"The truck slowed to turn into a driveway - the load shifted inside - and that compromised the natural gas system on the truck," according to Howard's Public Safety Director, Ed Janke. "The fuel system detonated and that resulted in one injury and one known fatality at this time."

Ace Manufacturing released this statement this afternoon saying, "Our thoughts and prayers go out to the family of the truck driver who lost his life in this accident, as well as another worker who was injured. We are a small and close-knit company and this has shaken and saddened all of us."

The Brown County Sheriff's Office has not yet released the names of these two men. For most of the afternoon Pamperin Road, between Velp Avenue and Cornell Road, was closed to traffic.

HOWARD, Wis. [redacted] The Brown County Sheriff's office is investigating a deadly explosion which occurred in the 2200 block of Pamperin Rd. in the Village of Howard. The Sheriff's Department tells us that a box-style truck carrying heavy equipment was slowing to turn into a driveway, when the load shifted forward, piercing a fuel tank and causing the truck to explode.

Authorities tell us the male driver was pronounced dead at the scene. A male passenger was reportedly thrown from the truck and transported to an area hospital with critical injuries.

A number of businesses were either evacuated or asked to take cover in a safe area while rescue crews addressed leaking fuels and removed the injured passenger. Howard Fire and Brown County Hazmat Teams secured the area so a Reconstruction Team could start to document the scene.

Pamperin Rd. between Velp Ave. and Cornell Road will remain closed for several hours while the investigation continues.

Local 5 has a crew on the scene, we'll bring you the latest information as it becomes available.

Hazmat crews at scene of Howard explosion

Truck explosion in Howard

Truck involved in deadly explosion in Howard

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news

PE14-020

11-4-2014

DATA TO ODI

NO LETTER

Request No. 5 Data Files

[redacted]

Posted: Fri 12:41 PM, Apr 04, 2014

UPDATED Friday, April 4, 2014 — 12:40 p.m.

HOWARD, Wis. (AP) – Brown County sheriff's authorities have identified the driver who was killed and the passenger who was injured when a box truck exploded in the Green Bay area.

[redacted] of the Oconto County community of Sobieski, died in the accident. [redacted] of Green Bay, is hospitalized with non-life threatening injuries.

The two were turning into a driveway in the village of Howard Thursday afternoon when the truck's load shifted forward and pierced the compressed natural gas fuel system, causing it to explode. The truck is leased to Ace Manufacturing, which is located near the scene of the accident.

Posted Thursday, April 3, 2014 — 5:13 p.m.

HOWARD, Wis. (AP) – One person is dead and another injured after a truck exploded near an industrial park in eastern Wisc

According to the Brown County Sheriff's Office, the box style truck slowed to turn into a driveway in the village of Howard at a pierced a fuel tank and caused the truck to explode.

In a news release, Lt [redacted] said the male driver died at the scene. A male passenger was thrown from the vehicle

Some of the nearby businesses were evacuated or employees asked to take cover while rescue crews looked into leaking fu

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