

National Highway Traffic Safety Administration

DOT HS 812 995



September 2020

# Special Crash Investigations: Remote Child Restraint System Crash and Fire Investigation; Vehicle: 2003 Ford F-250 Super Duty; Location: New York; Crash Date: August 2015

#### DISCLAIMER

This publication is distributed by the U.S. Department of Transportation, National Highway Traffic Safety Administration, in the interest of information exchange. The opinions, findings, and conclusions expressed in this publication are those of the authors and not necessarily those of the Department of Transportation or the National Highway Traffic Safety Administration. The United States Government assumes no liability for its contents or use thereof. If trade or manufacturers' names are mentioned, it is only because they are considered essential to the object of the publication and should not be construed as an endorsement. The United States Government does not endorse products or manufacturers.

Suggested APA Format Citation:

Crash Research & Analysis, Inc. (2020, September). Special Crash Investigations: Remote Child Restraint System Crash and Fire Investigation; Vehicle: 2003 Ford F-250 Super Duty; Location: New York; Crash Date: August 2015 (Report No. DOT HS 812 995). National Highway Traffic Safety Administration.

# **Technical Report Documentation Page**

	1	0		
1. Report No. DOT HS 812 995	2. Government Accession No.	3. Recipient's C	atalog No.	
4. Title and Subtitle		5. Report Date		
Special Crash Investigations:		September 20	020	
Remote Child Restraint System Crash and Fire Investigation; Vehicle: 2003 Ford F-250 Super Duty; Location: New York;		6. Performing C	Organization Code	
Crash Date: August 2015				
7. Author Crash Research & Analysis, Inc.		8. Performing C CR19038	Organization Report N	0.
<b>9. Performing Organization Name and Addr</b> Crash Research & Analysis, Inc.	255	10. Work Unit N	No. (TRAIS)	
P.O. Box 302		11. Contract or Grant No.		
Elma, NY 14059		693JJ919C000004		
12. Sponsoring Agency Name and Address		13. Type of Report and Period Covered   Technical Report   14. Sponsoring Agency Code		
National Highway Traffic Safety Administration 1200 New Jersey Avenue SE				
Washington, DC 20590		1 in Sponsoring	igeney cour	
Each crash represents a unique sequen crashworthiness performance of the in data are based on information availabl submitted.	ce of events, and generalized volved vehicle(s) or their safe e to the Special Crash Investig	ty systems. This	not be made conce is report and associ- the date this report	erning the ated case was
This remote investigation documents t pickup in which a 6-month-old female position. The Ford was involved in a h median of a two-lane divided roadway curve, the Jeep crossed the painted me counterclockwise and came to rest, wh both vehicles. The driver of the Ford r from passersby. Attempts to assist the Both occupants of the Ford were trans- police-reported incapacitating leg inju- injured. The 56-year-old female who w crash fire.	he crash and subsequent fire i was restrained in a child restr ead-on configuration crash with As the belted 24-year-old ma dian and struck the Ford head here a post-crash fire ensued the emoved the infant from the Cl driver of the Jeep were unsuc- ported by ambulance to a loca ry (A-level), but was treated a vas operating the Jeep died at	nvolving a 200 raint system (Cl ith a 2011 Jeep ale driver of the -on. The vehicl hat consumed th RS and evacuat cessful due to t 1 hospital. The nd released. Th the scene as a r	3 Ford F-250 Super RS) in the second r Liberty SUV that of e Ford was negotiat es both rotated ne occupant compa- ed the vehicle with he advancement of driver of the Ford s the 6-month-old infa result of the crash a	r Duty ow center crossed the ing a left rtments of assistance the fire. sustained a nt was not nd post-
17. Key Words child restraint system, infant, belted		<b>18. Distribution Statement</b> The document is available to the public from the National Technical Information Service, www.ntis.gov.		
19 Security Classif. (of this report)	20. Security Classif (of t	his nage)	21 No. of Pages	22. Price
Unclassified	Unclassified	P*8*/	16	
			10	

Form DOT F 1700.7 (8-72)

Reproduction of completed page authorized

# **Table of Contents**

BACKGROUND	.1
SUMMARY	.1
Crash Site	1
Pre-Crash	2
Crash	3
Post-Crash	3
2003 FORD F-250 SUPER DUTY	.4
Description	4
Exterior Damage	5
Interior Damage	5
Manual Restraint Systems	6
Supplemental Restraint Systems	6
Child Restraint System	6
2003 FORD F-250 SUPER DUTY OCCUPANT DATA	.6
Driver Demographics	6
Driver Injuries	7
Driver Kinematics	7
Second Row Center Occupant Demographics	7
Second Row Center Occupant Injuries	8
Second Row Center Occupant Kinematics	8
2011 JEEP LIBERTY	.8
Description	8
Exterior Damage	9
Occupant Data1	0
CRASH DIAGRAM1	1

Special Crash Investigations Remote Child Restraint System Crash and Fire Investigation Case Number: CR19038 Vehicle: 2003 Ford F-250 Super Duty Location: New York Crash Date: August 2015

### BACKGROUND

This remote investigation documents the crash and subsequent fire involving a 2003 Ford F-250 Super Duty pickup in which a 6-month-old female was restrained in a child restraint system (CRS) in the second row center position. The Ford was involved in a head-on crash with a 2011

Jeep Liberty sport utility vehicle (SUV) that crossed the median of a two-lane divided roadway. As the belted 24-year-old male driver of the Ford was negotiating a left curve, the Jeep crossed the painted median and struck the Ford head-on. The vehicles rotated counterclockwise and came to rest, where a post-crash fire consumed the occupant compartments of both vehicles (**Figure 1**). The driver of the Ford removed the infant from the CRS and evacuated the vehicle with assistance from passersby. Attempts to assist the driver of the Jeep were unsuccessful due to the advancing fire. Both occupants of the Ford were transported by ambulance to a local hospital. The driver of the



**Figure 1**. View of the Ford and Jeep at final rest (on-scene law enforcement image).

Ford sustained a police-reported incapacitating leg injury (A-level), but he was treated and released. The 6-month-old infant was not injured. The 56-year-old female who was operating the Jeep died at the scene as a result of the crash and post-crash fire.

This crash was identified through a search of the Fatality Analysis Reporting System (FARS) for fatal crashes involving vehicle fires and children restrained in a CRS. The police crash report was forwarded to the SCI team at Crash Research and Analysis, Inc., in September 2019, by the National Highway Traffic Safety Administration's Crash Investigation Division. The SCI team initiated contact with the investigating law enforcement agency and obtained a detailed crash investigation report that included digital copies of on-scene and follow-up images of the crash site and the involved vehicles. Requests for records documenting the injuries sustained by the Ford's driver were refused by the treating medical facility. As of the date of this report, the Ford's driver has not responded to multiple attempts by the SCI team to contact him for interview.

#### SUMMARY

#### Crash Site

This crash occurred on a two-lane east/west roadway during the evening. At the time of the crash, conditions reported by the National Weather Service included clear skies, a temperature of

27°C (80°F), 40-percent relative humidity, and northwesterly winds at 8 km/h (5 mph). In the vicinity of the crash, the approximate 3.5 m (11.5 ft) wide travel lanes curved to the left for eastbound traffic. They were divided by an approximate 1.4 m (4.6 ft) wide painted median, which consisted of two sets of double yellow centerlines (**Figure 2**). The edges of the travel lanes were solid white lines, which transitioned to paved shoulders that varied in width from approximately 1.6 m (5.2 ft) to 2.9 m (9.5 ft). The PAR described the roadway as asphalt, level, and dry. A W-beam guardrail was located adjacent to the south shoulder and terminated near the point



**Figure 2**. Eastbound view of the crash site (on-scene law enforcement image).

of impact. An overhead luminaire was located off the south shoulder and provided artificial lighting at the crash site. Curve warning signs were present outboard of the W-beam guardrail system for westbound traffic. The posted speed limit was 72 km/h (45 mph). A crash diagram is included at the end of this report.

#### Pre-Crash

The police reported that the 24-year-old male driver of the Ford awoke at 0430 hours on the morning of the crash. He arrived at his workplace at approximately 0520 hours and drove a work truck to various job sites throughout the day before returning the work truck at 1740 hours. He entered the 2003 Ford F-250 Super Duty and proceeded to a friend's house and later drove to his parent's house, where he ate, conversed, and watched television. The driver left his parent's house and met a caregiver of the 6-month-old infant at a local business to pick up the infant. He placed the infant in the rear-facing CRS and restrained her using the integral 5-point harness system. The CRS was secured in the second row center position of the Ford using the vehicle's manual lap belt with locking latch plate. It is unknown if a base was used for the installation. The driver then operated the Ford toward his residence, traveling in an easterly direction on the two-lane divided roadway.

The Jeep traveled westbound on the same roadway, operated by the 56-year-old female driver. Witnesses at several locations observed the Jeep driving erratically prior to the crash. The Jeep crossed the double yellow centerline line and median while passing one of the witnesses, departed the right road edge and traveled over a curb, and also turned left on a red traffic signal. The driver operated the Jeep in a westerly direction on the two-lane divided roadway in an erratic manner on approach to the curve. The Jeep then drifted left from its travel lane and across the median as it entered the curve.

According to law enforcement documentation of the crash, the driver of the Ford observed the Jeep traveling westbound without its headlights on, traversing the painted median, and encroaching into his lane of travel while he negotiated the left curve. Per the police crash report, the driver could not recall if he initiated avoidance actions prior to impact. **Figure 3** shows the eastbound approach of the Ford, and **Figure 4** shows the westbound approach of the Jeep.



**Figure 3**. Eastbound approach of the Ford to the crash site (on-scene law enforcement image).



**Figure 4**. Westbound approach view of the Jeep to the crash site (on-scene law enforcement image).

#### Crash

The crash occurred as the left and center aspects of the Ford's front plane were struck by the left and center aspects of the Jeep's front plane, in an offset head-on configuration. Resultant directions of force were in the 11 o'clock sector for the Ford and the 12 o'clock sector for the Jeep. The left offset impact to the Ford induced a counterclockwise rotation to both vehicles as they engaged. The Ford rotated approximately 90 degrees counterclockwise from impact and came to rest on the roadway perpendicular to the eastbound travel lane, facing north. Its front

axle was on the double yellow lines of the median, and its rear axle was on the south shoulder. The Jeep also rotated counterclockwise during the impact and remained engaged against the Ford's front left corner area. It completed approximately 120 degrees of rotation and came to rest straddling the median, facing east. **Figure 5** depicts the final rest position of the vehicles. Following the crash, a fire developed that ultimately consumed the occupant compartments of both vehicles.

#### Post-Crash

Immediately following the crash, the driver of the Ford observed flames emanating from the engine compartment. He attempted to open the left front



**Figure 5**. Southerly view of the final rest positions of the involved vehicles (on-scene law enforcement image).

door, but it was jammed closed. The driver unbuckled his seat belt system and slid across the front row bench seat, then opened the right front door and exited the vehicle.

The driver then opened the right rear door and removed the infant from the rear-facing CRS. As he began to carry the infant from the vehicle, he fell several times due to a lower leg injury. A female passerby stopped at the crash site and took the infant from the driver. She carried the infant to the roadside away from the vehicles. The driver limped to her location on the roadside. He borrowed a cell phone and called his parents while a passerby notified the emergency

response system. Passersby stopped to render aid to the occupants of the crash. Several attempted to push the Jeep away from the Ford, without success. Another passerby attempted to push the Jeep away from the Ford by backing his pickup truck into the left rear quarter panel of the Jeep. As he was attempting this maneuver, he observed the driver's air bag was deployed in the Jeep. This pushing effort to separate the vehicles was unsuccessful, but produced damage to the left rear quarter panel of the Jeep and further rotated the Jeep counterclockwise against the Ford (**Figure 6**). The witness, who observed the Jeep pre-crash, was towing a boat. As he arrived at the crash site, he retrieved the fire extinguisher from the boat and attempted to extinguish the fire

in the Jeep. The fire became too intense, and efforts to remove the driver from the Jeep were unsuccessful.

Police, fire, and emergency medical personnel arrived at the scene. The driver and infant occupant of the Ford were transported by ambulance to a local hospital. The driver was treated for a lower leg fracture and released. The infant occupant was evaluated and was determined to have been uninjured. Firefighters ultimately extinguished the fire and removed the body of the Jeep's driver from the vehicle. Her body was transferred to the medical examiner's office for autopsy.

#### 2003 FORD F-250 SUPER DUTY

#### Description

The 2003 F-250 Super Duty (**Figure 7**) was a crew cab, short-bed pickup truck. It was identified by the Vehicle Identification Number (VIN) 1FTNW21L53Exxxxx. Power was provided by a 5.4-liter, V-8, gasoline engine linked to a 4-wheel-drive driveline. Standard features included power-assisted 4-wheel disc brakes with ABS and electronic brakeforce distribution. Aftermarket step bars were mounted to the frame of the Ford along the sides of the cab.

No further specifications concerning the Ford's



**Figure 6**. Easterly view of the vehicles at final rest (on-scene law enforcement image).



**Figure 7**. Right front oblique view of the Ford during the law enforcement inspection (law enforcement image).

dimensions, weight ratings, and manufacturer-recommended equipment were available due to the remote nature of this investigation.

The cab consisted of four forward-hinged doors and a rigid B-pillar. The interior was configured with a split-bench front seat with a fold down center armrest/seat back and a second row bench seat, which provided seating for up to six occupants. The front row center position had a fold-down center armrest that doubled as the front row center position's seatback. Integrated head restraints were standard equipment for the front row outboard positions. Safety systems included

manual 3-point lap and shoulder safety belts for the four outboard positions and lap belts for the front and second row center positions. Supplemental safety systems included dual-stage frontal air bags for the driver and front row right positions, with front safety belt retractor pretensioners.

#### **Exterior Damage**

The exterior crash damage to the Ford involved the front plane, the left front fender and its structure, and the left front tire/wheel/driveline and suspension (Figures 8 and 9). Directly involved were the left and center aspects of the front plane, with vertical involvement from the bumper/frame to the hood. The bumper was crushed and buckled at the centerline with lateral displacement to the right, indicative of an 11 o'clock direction of force. The left front tire and wheel of the Ford were displaced rearward by the engagement, reducing the left wheelbase by an estimated minimum of 25 cm (10 in). The estimated maximum bumper beam crush was 51 cm (20 in), located adjacent to the left frame rail. An estimated collision deformation classification (CDC) of 11FYEW3 was assigned to the Ford for the front plane damage pattern.



**Figure 8**. Front plane damage to the Ford (law enforcement inspection image).

A post-crash fire that probably originated in the engine compartment of the Jeep proliferated and consumed the engine compartment and occupant compartment of the Ford. According to law enforcement records, the driver of the Ford reported that he observed the fire forward of his

driving position immediately following the crash. The fire consumed combustible materials in the engine compartment and grew in size and ferocity, before it spread to the Ford's interior. Based on the law enforcement images, the fire largely consumed the majority of the combustible materials in the engine and occupant compartments before it was extinguished.

#### Interior Damage

Minor intrusion of the front left occupant space of the Ford was identified in the available law enforcement images. The left Apillar was displaced rearward, which had effectively jammed the left front door closed. The left corner of the instrument panel and the



**Figure 9**. Front left oblique view of the crash and fire damage to the Ford (law enforcement inspection image).

toe pan also appeared to have intruded rearward. The post-crash fire consumed nearly all the combustible material in the Ford's interior (**Figures 10** and **11**). As a result of the fire, any

evidence of occupant contact was destroyed, and the deployment status of the frontal air bags is unknown. All the vehicle's glazing was destroyed by the fire.



**Figure 10**. Fire damage to the front row of the Ford (law enforcement image).



**Figure 11**. Fire damage to the second row of the Ford (law enforcement image).

# Manual Restraint Systems

Based on manufacturer specifications, the Ford was equipped with 3-point lap and shoulder seat belts for the outboard positions of both the front and second rows. The center positions of both rows were configured with lap belts only. Retractors for the driver and front right positions were equipped with pretensioners. The post-crash fire consumed the entire interior of the Ford, including the combustible components of the manual restraint systems. This prevented their inspection/assessment.

#### Supplemental Restraint Systems

As standard equipment, the Ford was equipped with dual-stage driver's and passenger's frontal air bags for the driver and front right passenger positions. The passenger's frontal air bag could be controlled by an air bag cutoff switch. Although not confirmable due to the post-crash fire, the frontal air bags probably deployed, and the retractor pretensioners probably actuated as a result of the crash.

#### **Child Restraint System**

Based on the driver's statements documented in the law enforcement records, the 6-month old female infant was restrained in a rear-facing infant CRS. The specific make/model of the CRS remains unknown, as the entire CRS was consumed by the post-crash fire. The CRS had been secured in the Ford's second row using the vehicle's manual lap bet. The infant was restrained in the CRS by its integral 5-point harness system.

#### 2003 FORD F-250 SUPER DUTY OCCUPANT DATA

#### Driver Demographics

24 years/male		
Unknown		
Unknown		
Unknown		

Seat type:	Forward-facing split-bench seat
Seat track position:	Unknown
Manual restraint usage:	3-point lap and shoulder seat belt
Usage source:	Law enforcement documentation
Air bags:	Dual-stage frontal air bag available;
	deployment presumed
Alcohol/drug data:	None
Egress from vehicle:	Exited vehicle without assistance
Transport from scene:	Ambulance to a local hospital
Type of medical treatment:	Treated and released

#### Driver Injuries

Injury No.	Injury	Injury Severity AIS 2015	Involved Physical Component (IPC)	IPC Confidence Level
1	Lower leg fracture, NFS	852002.2	Left instrument panel	Possible

*Source: law enforcement records. Multiple requests for medical records have been denied. Note: This injury could not be coded electronically due to the lack of its specificity.* 

#### **Driver Kinematics**

The 24-year-old male driver of the Ford reported to the investigating law enforcement agency that he was restrained by the manual 3-point lap and shoulder seat belt. Due to the remote nature of this investigation and the post-crash fire that consumed the interior of the Ford, seat belt usage, air bag deployment, and specific occupant contact points could not be determined from physical evidence. However, based on the injury outcome of the driver and the apparent severity of the crash, it is likely that he was belted and that the seat belt retractor pretensioner actuated and the driver's frontal air bag deployed. If the driver had been unbelted and not subjected to supplemental restraint protection, he likely would have sustained significant injuries in the crash.

At impact with the Jeep, the Ford's frontal air bag system likely deployed and the driver's retractor pretensioner likely actuated. The driver would have initiated a forward trajectory and loaded the safety belt system and the deployed air bag. His knees probably contacted the lower instrument panel, and intrusion of the left floor/toe pan and lower instrument panel likely exacerbated his lower extremity contact. This was evidenced by the visual deformation to the vehicle observed in law enforcement images and the documented injury sustained by the driver.

Immediately following the crash, the driver unbuckled his seat belt system, slid across the front row bench seat, and exited the Ford through the right front door. He then removed the infant from the second row. The driver was transported to a local hospital, where he was treated for his leg injury and released. The treating facility denied multiple requests for a copy of his records.

#### Second Row Center Occupant Demographics

01
6 months/female
Unknown
Unknown
Unknown

Seat type:	Forward-facing bench seat
Seat track position:	Fixed
Manual restraint usage:	Rear-facing CRS secured by the vehicle's lap belt
Usage source:	Police crash report
Air bags:	None available
Alcohol/drug data:	None
Egress from vehicle:	Removed from CRS by the driver
Transport from scene:	Ambulance to a local hospital
Type of medical treatment:	Not injured

# Second Row Center Occupant Injuries

Injury No.	Injury	Injury Severity AIS 2015	Involved Physical Component (IPC)	IPC Confidence Level
1	Not injured	N/A	N/A	N/A

Source: official records.

# Second Row Center Occupant Kinematics

The infant occupant was positioned in a rear-facing CRS in the center position of the Ford's second row. The CRS was secured to the vehicle by the driver using the vehicle's lap belt system. The infant was restrained in the CRS by its integrated 5-point harness system. Complete consumption of the CRS by the post-crash fire prevented identification/documentation of the CRS. The specific manufacturer and model could not be determined, nor could the adjustment of the restraint systems.

At impact with the Jeep, the infant initiated a forward trajectory. Her back and head loaded against the shell of the CRS, but the harness system held her in the confines of the CRS. Her distributed loading across the surface area of the CRS shell mitigated injury.

Following the crash, the driver exited through the right front door of the Ford and opened the right rear door to gain access to the second row. He unbuckled the infant from the CRS and carried her away from the vehicles and ensuing fire. A passerby assisted the driver with the infant as they waited for emergency services personnel. The infant was transported with the driver to a local hospital, where she was examined for possible injury (none found) and released.

#### **2011 JEEP LIBERTY**

#### Description

The 2011 Jeep Liberty was a 4-door SUV (**Figure 12**). No VIN was included in the law enforcement documentation of the crash or otherwise available as part of this SCI



**Figure 12**. Right front oblique view of the Jeep during the law enforcement inspection (law enforcement image).

investigation. Due to the remote nature of this investigation and the post-crash fire damage, data for this vehicle was derived from manufacturer specifications and standard equipment. The Jeep was powered by a 3.7-liter, gasoline engine linked to a 4-speed automatic transmission, with 4-wheel drive. Standard features included power-assisted disc brakes with ABS and electronic brake force distribution, traction control, electronic stability control, and a tire pressure monitoring system.

The interior was configured for the seating of up to five occupants, with front row bucket seats and a three-passenger second row bench seat. Safety systems included manual 3-point lap and shoulder seat belts for the five positions, with front row retractor pretensioners. Supplemental restraint was provided by a Certified Advanced 208-Compliant frontal air bag system for the driver and front right passenger positions. A passerby who attempted to separate the involved vehicles observed that the driver's frontal air bag in the Jeep had deployed in the crash.

#### **Exterior Damage**

Based on a review of the available law enforcement images, the direct contact damage to the Jeep from the front plane impact with the Ford primarily involved the left and center aspects. The bumper beam and its mounting brackets appeared to have separated from the frame rails, or were consumed by the fire. All components forward of and surrounding the engine block were displaced and/or consumed by the fire. The hood separated from the radiator support-mounted latch assembly and was crushed upward and rearward, and the left front fender was also crushed rearward. The left front axle position was displaced rearward, which had visibly shortened the left wheelbase. There was rearward displacement of the left A-pillar, with corresponding compression of the left front door. Due to the severity of the damage and separation of components, a crush profile could not be estimated for this damage. However, the estimated CDC for the Jeep's front plane damage pattern, associative to the frontal impact with the Ford, was 12FYEW4.

Damage was visible at the left rear quarter panel, and the gas cap door was deformed open. Based on a witness statement to the police, this damage occurred during post-crash efforts to separate the vehicles, using the back plane of another vehicle, in an attempt to push the Jeep away from the Ford. This damage was not crash-related and was disregarded.



**Figure 13**. Front plane damage to the Jeep (law enforcement image).



**Figure 14**. Front left oblique view of the damage to the Jeep (law enforcement image).

The crash-induced fire consumed the entirety of the combustible materials in the engine compartment and interior of the Jeep. The exterior fire damage to the Jeep involved all four planes and the roof. The burn pattern was indicative of a fire that probably originated in the engine compartment area of the Jeep and proliferated rearward to the occupant compartment. All four tires remained largely intact, with less exterior fire damage to the back plane. **Figures 13** and **14** depict the crash and fire damage to the Jeep.

#### **Occupant Data**

The driver of the Jeep was a 56-year-old female. Witnesses to the crash had observed the Jeep driving erratically during its pre-crash operation, with the headlights off. Passersby at the crash site attempted both to suppress the fire involving the Jeep and extricate the driver, but they were unable to retrieve her due to the speed and intensity of the post-crash fire. The driver was pronounced deceased at the crash site. Her remains were recovered from the vehicle and transferred to the medical examiner's office for autopsy. The Jeep driver's officially reported cause of death was blunt impact and thermal burn injuries.

# **CRASH DIAGRAM**



DOT HS 812 995 September 2020



U.S. Department of Transportation

National Highway Traffic Safety Administration



14886-080520-v2