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Each crash represents a unique sequence of events and generalized conclusions cannot be made concerning the crashworthiness performance of the involved vehicles or their safety systems. This report and associated case data are based on information available to the Special Crash Investigation team on the date this report was published.

16. Abstract

This report documents the remote vehicle fire/child restraint system (CRS) investigation of a 2009 Ford Focus involved in a single-vehicle crash and post-crash fire with a child seated in a CRS. The crash occurred at night in September 2017 on an undivided, two-lane, north/south, State route in a rural area of Missouri. The Ford was being driven northbound at a police-calculated speed of 76 km/h (47 mph) by a belted 22-year-old male. The other occupants included an 18-year-old male (restraint status unknown) seated in the front passenger seat, a 3-month-old male restrained in a rear-facing CRS in the second row left position, and a belted 21-year-old female seated in the second row right position. Conditions were dark, clear, and dry. For unknown reasons, the Ford departed the roadway on the right edge and its front plane struck several stationary roadside objects, including a large tree. At final rest it initiated a post-impact fire from an unknown source that fully consumed the interior. The driver and both second row occupants were assisted from the vehicle by passersby. Efforts to remove the entrapped front right occupant were unsuccessful and he sustained fatal injuries, including severe burns, and was declared deceased on-scene. The driver and second row right occupant sustained police-reported "A" severity (incapacitating) injuries and the second row left occupant was not injured. The surviving occupants were transported by ambulance to a hospital for treatment and the Ford was towed due to damage.

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Special Crash Investigations
Remote Vehicle Fire/Child Restraint System Investigation
Case Number: DS19021
Vehicle: 2009 Ford Focus
Location: Missouri
Crash Date: September 2017

Background

This report documents the remote vehicle fire/child restraint system (CRS) investigation of a 2009 Ford Focus (Figure 1) involved in a single-vehicle crash and post-crash fire with a child occupant seated in a CRS. The investigation is intended to examine the events leading to the fire, how quickly the fire spread to the occupant compartment, the magnitude of the fire, the time sequence in which emergency medical services (EMS) and other responders arrived on-scene, occupant restraint usage, demographics, injury data, and CRS usage. The crash was identified during a review of Fatality Analysis Reporting System (FARS) crash reports. The criteria for the crash type includes an impact not involving the back plane, a fire that spreads to the occupant compartment, and at least one occupant seated in a CRS. The Special Crash Investigations (SCI) group of the National Highway Traffic Safety Administration assigned the case in August 2019.

Figure 1. 2009 Ford Focus (police photo)

The crash occurred at night in September 2017 on an undivided, two-lane, north/south, State route in rural Missouri. The Ford was being driven northbound at a police-calculated speed of 76 km/h (47 mph) by a belted 22-year-old male. The other occupants included an 18-year-old male (restraint status unknown) in the front passenger seat, a 3-month-old male restrained in a rear-facing CRS in the second-row left position, and a belted 21-year-old female seated in the second-row right position. Conditions were dark, clear, and dry. For unknown reasons, the Ford departed the roadway on the right edge and its front plane struck several roadside stationary objects, including a large tree. At final rest a post-impact fire originated from an unknown source that fully consumed the interior. The driver and both second-row occupants were assisted from the vehicle by passersby. Efforts to remove the trapped front right occupant were unsuccessful. He sustained fatal injuries, including severe burns, and was declared deceased on-scene. The driver and second-row right occupant sustained police-reported “A” severity (incapacitating) injuries, and the child in the CRS was not injured. The surviving occupants were transported by

ambulance to hospitals for treatment and the Ford was towed due to damage. The vehicle was configured with an airbag control module that had event data recorder (EDR) capability supported by the Bosch Crash Data Retrieval (CDR) system. Police indicated in their report that the EDR was destroyed during the fire and no EDR imaging was obtained.

Summary

Crash Site

The crash site was a two-lane, undivided roadway oriented in a north/south direction in a rural area of Missouri. The surface was paved with asphalt in traveled and polished condition. According to police measurements, the lanes measured 3.3 m (11.0 ft) in width and were separated by a solid double yellow painted stripe and bordered by solid white painted fog lines. The roadway was straight and level. The roadsides consisted of sloping ground with drainage ditches and driveways present on the east side. The speed limit was 89 km/h (55 mph). Conditions at the time of the crash were dark without illumination, clear, and dry. A crash diagram is included at the end of this report.

Pre-Crash

The Ford was traveling northbound at a police- calculated minimum speed of 76 km/h (47 mph) when, for unknown reasons, it departed the roadway on the right edge at an approximate angle of 6.5 degrees. The police-reported superelevation at the area of the departure was 1.3 percent. Tire impressions in the roadside grass indicated it then traveled in a relatively straight line without evidence of abrupt steering, braking, or attempts to return to the roadway.

Crash

The crash included five events. After departing the roadway and traveling approximately 23 m (75 ft), the vehicle's front plane struck a mail box post (Event 1). It continued in the same trajectory for 25 m (82 ft) before striking a telephone utility junction box (Event 2), then continued another 10 m (34 ft) before striking a vinyl fence (Event 3), and finally striking a mature tree (Event 4) having a diameter greater than 30 cm (11.8 in). The calculated impact speed for Event 4 was 54.4 km/h (33.8 mph). Following the tree impact, the Ford was displaced to the left and rotated clockwise, coming to rest on the roadside and facing south (Figure 2). Following the crash, a major fire originated from an unknown source, which burned all exterior planes and fully consumed the interior (Event 5).

Figure 2. Crash site looking north, struck tree on right (police photo)

Post-Crash

Passersby stopped and assisted the driver and both second-row occupants from the vehicle. The front-row right occupant was likely entrapped due to intrusion, and passersby attempts to remove him from the vehicle were unsuccessful. Efforts to remove the second-row left occupant in a CRS included breaking through the second-row window. The vehicle fire started and efforts by passersby to suppress it using a fire extinguisher were unsuccessful. The fire department arrived to find the vehicle fully involved with fire and the front passenger still trapped in the vehicle. The occupant was removed following suppression of the vehicle fire and declared deceased on-scene. The driver and second-row right occupant were transported with “A” (incapacitating) injuries and the child was transported without injuries as a precaution and for treatment of a pre-existing condition. The Ford was towed due to damage and placed on a police hold.

2009 Ford Focus

Description

The 2009 Ford Focus was a 4-door sedan identified by the Vehicle Identification Number 1FAHP35N29Wxxxxxx. The last known electronic odometer reading obtained from a vehicle history report was 608,400 km (378,042 mi). It had two rows to seat five occupants, a 4-cylinder, 2.0-liter, gasoline engine, front-wheel drive, antilock brakes and tilt steering column functionality. The front row was configured with bucket seats and adjustable head restraints. The front-row occupants' seat track settings were unknown. The vehicle manufacturer recommended size P195/60R15 tires for the front and rear. The left rear tire was a Sumitomo Touring LST size P195/65R15. The other tires were burned and no additional tire data was available.

Exterior Damage

The Ford sustained severe crush to the front plane in the impact with the mail box post, utility box, fence, and tree (Figure 3), and additional damage to all planes caused by the fire. The front bumper fascia and grille were missing and the bumper backing bar was used to estimate crush to the front plane. The damage flow suggested direct damage began at the front right bumper corner and extended right to the approximate longitudinal centerline. End shift to the right was present. The estimated Collision Deformation Classification for the Ford in the Event 4 tree impact was 12FZEW4. Damage to the front end caused by prior impacts were masked by the tree impact damage.

Figure 3. Front plane damage, 2009 Ford Focus (police photo)

Vehicle Fire Discussion

The Ford sustained a major post-impact fire that burned all exterior planes and fully consumed the interior. Soon after the crash, a truck driver stopped and attempted to suppress the fire with his fire extinguisher. When that effort was unsuccessful, he and another passerby assisted the driver and both second-row occupants from the vehicle. The front right occupant was trapped in the vehicle and the passersby were unable to extricate him. The local fire department was dispatched at 5 minutes after the crash and responded in 12 minutes with one engine truck and one rescue unit. They arrived on-scene to find the vehicle fully involved and all occupants except the front right occupant outside of the vehicle. A second engine unit was dispatched for fire suppression and to establish a landing zone for air ambulances. Ten fire personnel responded.

Following suppression of the vehicle fire, the deceased front right occupant was removed from the vehicle. The fire units were cleared from the scene approximately 3 hours 7 minutes after the crash. The fire incident report did not identify the origin or source for the fire. It did not mention any contributory or unusual elements.

Child Restraint System Discussion

Dorel/Cosco/Light "N" Comfy Realtree Infant Safety Seat

The 3-month-old male occupant was seated in a Cosco Light 'N' Comfy Realtree Infant Safety Seat (ISS) (Figure 4). The manufacture date was February 16, 2016. A partial serial number visible in police photos was x229AVQx and the model number was illegible. The seat was intended for rear-facing orientation only and was configured with a detachable, stay-in-vehicle base, adjustable carry handle, 5-point harness, fabric canopy, removable cushion, side impact protection, 4-position harness adjustment, multi-position recline adjustment, and Lower Anchors and Tethers for Children (LATCH).

Figure 4. Cosco Light 'N' Comfy infant safety seat (police photo)

The seat was installed rear-facing in an unknown manner. It could be installed using the vehicle seat belt or LATCH (lower anchors only). The second row left seat position of the Ford was configured with a lap and shoulder seat belt and LATCH. The occupant parameters for using this seat were as follows.

Weight: 1.8 - 10 kg (4 - 22 lb)
Height: 74 cm (29 in) or less
Top of the head 1 inch or more from the top of the restraint
Upper harness slots must be even with or just below the shoulders

The occupant met the weight requirements. He was a 24-week-old infant and, given his age, weight, and pre-existing condition, it was likely that he met the height requirements.

Vehicle History

A vehicle history report obtained by police indicated the vehicle's last known odometer reading was 608,400 km (378,042 mi). The vehicle had five previous owners including use as a rental vehicle. The vehicle history report identified a non-deployment crash involving another vehicle

approximately 3 months prior to this crash. Damage from the prior crash was located on the left plane. The current owner had purchased the vehicle approximately 6 weeks following that prior crash. It was unknown if repairs were made following the prior crash.

NHTSA Recalls and Investigations

A vehicle search using the VIN last queried in April 2021 revealed no open recalls.

Interior Damage

The Ford's interior sustained catastrophic damage caused by fire (Figure 5). Post-crash integrity loss was documented in medical records. Crash-related damage to the interior was unknown.

Figure 5. Second row left seat, 2009 Ford Focus (police photo)

Manual Restraint Systems

The Ford was equipped with three-point continuous lap and shoulder seat belts for the five seat positions. According to the police report and medical records, the driver and second-row right position occupants were belted and the second-row left position child was restrained in a CRS. Restraint usage by the front-row right occupant was unknown.

Supplemental Restraint Systems

The Ford was equipped with frontal and seat-mounted side impact air bags for the driver and front passenger and inflatable curtain air bags for both rows. While the crash severity suggests at least one frontal deployment level event probably occurred, the vehicle's air bags were destroyed by fire and deployment data was not available. A vehicle history report indicated the vehicle had five prior owners and the air bag status and history were not determined. It was involved in a non-deployment crash approximately 3 months prior to this crash.

2009 Ford Focus Occupants

Driver Demographics

Age/sex:	22 years old/male
Height:	180 cm (70 in)
Weight:	113 kg (249 lb)
Eyewear:	Unknown
Seat type:	Bucket with adjustable head restraint
Seat track position:	Unknown
Manual restraint usage:	Lap and shoulder belt used
Usage source:	Police report, medical records
Air bags:	Frontal air bag, seat-mounted side impact and IC air bags available, unknown if deployed
Alcohol/drug data:	None
Egress from vehicle:	Exited with assistance
Transport from scene:	Helicopter to hospital
Type of medical treatment:	Hospitalization 6 days

Driver Injuries

Inj. No.	Injury	Injury Severity AIS 2015	Involved Physical Components (IPC)	IPC Confidence Level
1 2	Fractures, right ribs, R3-R8 Right-sided hemopneumothorax	450203.3 442205.3	Tandem – shoulder belt, steering wheel	Probable
3	Fracture, closed, comminuted, displaced, right femur mid-shaft	853271.3	Left lower IP	Probable
4 5	Fracture, closed, comminuted, displaced, intra-articular fractures of the distal left radius and ulnar styloid.	752351.2 752353.2	Left IP	Possible
6	Abrasion, upper abdomen	510202.1	Steering wheel rim	Probable
7	Laceration, minor (3 cm/1.2 in), penis	543022.1	Seat cushion	Possible
8	Abrasion, right arm	710202.1	Steering wheel rim	Probable
9	Abrasion, right distal thigh	810202.1	Left lower IP	Probable

Source: Medical records

Driver Kinematics

The belted 22-year-old male driver was seated in an unknown posture. The Ford departed the roadway on the right edge and, presumably, the driver was not in control of the vehicle. At impact with the mail box post, utility box, and tree, the driver likely remained in his seated position as the vehicle continued traveling in a straight and forward trajectory. At impact with the tree, he was displaced forward in response to the direction of force and loaded the seat belt. His chest continued forward, loading the steering wheel and causing multiple fractures to the right ribs and a hemopneumothorax. His knees continued forward contacting the lower IP, causing a fracture to the right femur. The driver's left arm was displaced forward, possibly contacting the left IP causing fractures to the left radius and ulna. The vehicle rotated clockwise and the driver remained in his seated position until being assisted from the vehicle by passersby. The driver was transported by air to a hospital where he was admitted for 6 days.

Front-Row Right Occupant Demographics

Age/sex:	18 years old/male
Height:	Unknown
Weight:	Unknown
Eyewear:	Unknown
Seat type:	Bucket with adjustable head restraint
Seat track position:	Unknown
Manual restraint usage:	Lap and shoulder seat belt available, unknown if used
Usage source:	Police report
Air bags:	Frontal air bag, seat-mounted side impact and IC air bags available, unknown if deployed
Egress from vehicle:	Declared deceased prior to removal from vehicle
Transport from scene:	None
Type of medical treatment:	None

Front-Row Right Occupant Injuries

According to the police report, the front passenger sustained unspecified crash-related injuries as well as burn injuries. Police photos revealed burn injuries of varying severity to most or all of his body. He was trapped in the vehicle and declared deceased on-scene before emergency responders removed him from the vehicle. Efforts to obtain his autopsy report were unsuccessful.

Inj. No.	Injury	Injury Severity AIS 2015	Involved Physical Components (IPC)	IPC Confidence Level
1	2nd or 3rd degree; partial or full thickness including incineration	912032.6	Fire	Certain

Source: Police report, photos

Front-Row Right Occupant Kinematics

The front-row right occupant's level of restraint was unknown. At impact with the mail box post, utility box, and tree, the occupant likely remained in his seated position as the vehicle continued traveling in a straight and forward trajectory. At impact with the tree, he was displaced forward in response to the direction of force. He sustained injuries of an unknown nature and was trapped in the vehicle. Efforts by passersby to remove him were unsuccessful and he sustained severe and fatal burn injuries caused by the vehicle fire.

Second-Row Left Occupant Demographics

Age/sex:	3 months old/male
Height:	Unknown
Weight:	3 kg (6 lb)
Eyewear:	None
Seat type:	Bench
Seat track position:	Not adjustable
Manual restraint usage:	CRS
Usage source:	Police report, medical records
Air bags:	IC air bag available, unknown if deployed
Egress from vehicle:	Removed due to age
Transport from scene:	Helicopter to hospital, transferred to second hospital
Type of medical treatment:	Hospitalized 3 days

Second-Row Left Occupant Injuries

According to the second-row left occupant's medical records, he was not injured. He was admitted 3 days for observation and treatment for a pre-existing condition.

Second-Row Left Occupant Kinematics

The 3-month-old occupant was restrained in a rear-facing CRS with a 5-point harness. The police report did not mention seat belt usage for this occupant and did specify how the CRS was secured in the vehicle. At impact with the tree, he was displaced toward the front of the vehicle in response to the direction of force. He was held in the CRS by the 5-point harness until the vehicle came to rest. Both the occupant and CRS were removed from the vehicle with assistance from passersby. The occupant's medical records indicated that emergency responders broke through the backlight glazing during efforts to remove the occupant and glass fragments were present on his clothing but no injuries were documented.

Second-Row Right Occupant Demographics

Age/sex:	21 years old/female
Height:	163 cm (64 in)
Weight:	102 kg (224 lb)
Eyewear:	None
Seat type:	Bench
Seat track position:	Not adjustable
Manual restraint usage:	Lap and shoulder belt used
Usage source:	Police report, medical records

Air bags: IC air bag available, unknown if deployed
Egress from vehicle: Exited with assistance
Transport from scene: Helicopter to hospital
Type of medical treatment: Hospitalized 3 days

Second-Row Right Occupant Injuries

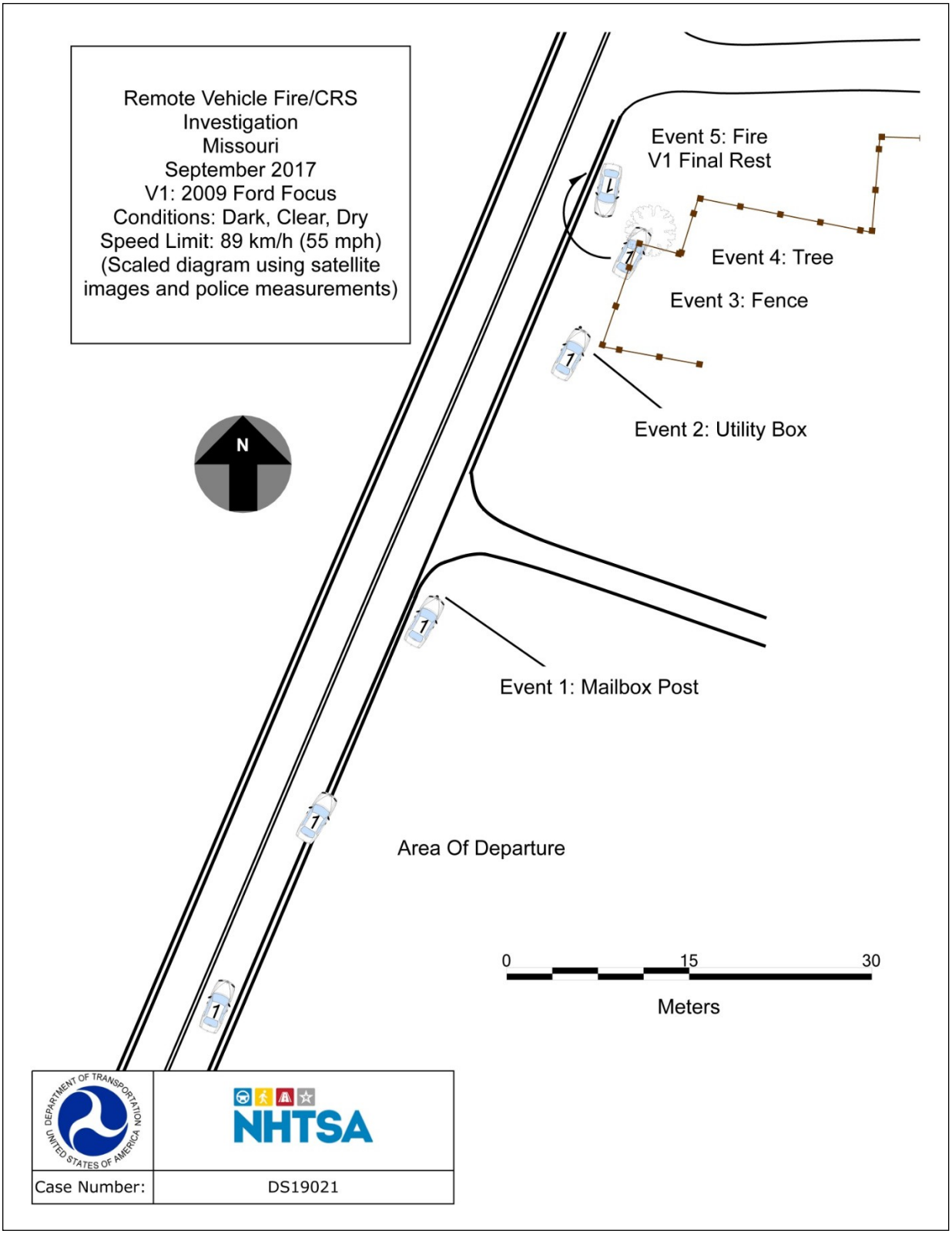
Inj. No.	Injury	Injury Severity AIS 2015	Involved Physical Components (IPC)	IPC Confidence Level
1	Multiple fractures, left ribs L3-L7	450203.3	Shoulder seat belt	Probable
2	Pneumothorax, left lung	442202.2	Shoulder seat belt	Probable
3	Contusions NFS, left lower lobe, lung	441406.2	Shoulder seat belt	Probable
4	Laceration, Grade 1, minor, liver	541822.2	Lap seat belt	Probable
5	Abrasion, forehead	210202.1	Front seat back	Probable
6	Abrasion, nose	210202.1	Front seat back	Probable
7	Contusion, left chest	410402.1	Shoulder seat belt	Probable
8	Abrasion, left breast	410202.1	Shoulder seat belt	Probable
9	Contusion, left abdomen	510402.1	Lap seat belt	Probable
10	Contusion, right knee	810402.1	Front seat back	Probable

Source: Medical records

Second-Row Right Occupant Kinematics

The belted 21-year-old female was seated in the second row right position. At impact with the tree, she was displaced forward, loading the seat belt in response to the direction of force causing internal injuries including fractures to multiple left ribs, a pneumothorax to the left lungs, contusions to the left lung, a minor laceration to the liver, and abrasions to the chest and abdomen. The occupant's head and neck continued to be displaced forward, contacting the front-row seat back and causing abrasions to the forehead and nose. Her legs contacted the front-row seat back, causing a contusion to the right knee. She remained in place in her seat until the vehicle came to rest. Passersby assisted her from the vehicle and she was transported to a hospital where she was admitted for 3 days.

CRASH DIAGRAM



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