

National Transportation Safety Board

Office of Highway Safety

Washington, DC 20594



HWY23MH006

VEHICLE FACTORS

Group Chair's Factual Report

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A. CRASH

Location: Delray Beach, Florida
Date: February 8, 2023
Time: 8:06 PM (EST)

B. VEHICLE FACTORS

Group Chair Jerome Cantrell
National Transportation Safety Board
Washington, DC

C. SUMMARY

For a summary of the crash, refer to the *Crash Summary and Information Report* which can be found in the NTSB docket for this investigation.

D. FACTUAL INFORMATION

The Vehicle Factors Group Chairman's Factual Report is a collection of factual information obtained during the detailed examination of the 2015 Nissan Rogue crossover-utility vehicle (SUV) and maintenance records obtained. The SUV was examined from February 10th through the 12th, 2023, at Westway Towing in Boca Raton, Florida. During the examination, the starter and alternator were removed from the engine and sent to Washington, DC to undergo operational testing. The Engine Control Unit (ECU) and Transmission Control Unit (TCU), which were found amongst the crash debris inside the vehicle, were collected and sent to Washington, DC for further analysis.

1.0 2015 Nissan Rogue

Make:	Nissan North America Inc
Model:	Rogue SL 4-door SV AWD ¹
VIN: ²	5N1AT2MV7FCXXXX
Model Year:	2015
Date of Manufacture:	Unknown
Placed into Service:	Unknown
Mileage:	Unknown

¹ All-Wheel Drive

² Vehicle Identification Number.

GVWR: ³ :	4,001 - 5,000 lbs.
Engine:	4-cylinder, 2.5 Liter, gasoline
Transmission:	Continuously variable-speed automatic (CVT)
Steering Gear:	Electric rack and pinion
Brake Type:	Hydraulic disc brakes with 4-wheel Antilock Braking System (ABS)

1.1 Damage Description⁴

For uniform description, "left" will refer to the driver's side, and "right" will refer to the passenger/curbside of the vehicle. The damage description will describe general body and frame damage sustained. Additional vehicle damage descriptions can be found in the docket for this investigation. In depth examinations of vehicle components will be described later in this factual report

The right-front fender along with the hood, radiator, air conditioning condenser, engine, transmission, the right-side frame horn, and both front drive axles and tires had separated from the engine firewall to the front bumper during the crash sequence. The left-side fender, wheel well, frame horn, and brake master cylinder all sustained crash damage, but remained attached to the SUV - **See Figure 1**. The exterior sheet-metal skin for the right-side passenger doors was missing. During recovery activities, the roof of the SUV had been cut off as indicated by the cut marks on the A through C pillars. All vehicle glass, except for the rear hatch door, was missing. The right-rear quarter fender was crushed inward toward the left side. The rear hatch door was found detached from the SUV but was located inside the passenger compartment with other crash debris. The rear bumper cover had torn away from the rear bumper and was displaced to the left. The left side driver and passenger doors were wedged closed.

³ Gross Vehicle Weight Rating (GVWR) is the total maximum weight that a vehicle is designed to carry when loaded, including the weight of the vehicle itself, plus fuel, passengers, and cargo.

⁴ See Vehicle Attachment - Vehicle Examination Photographs for additional photographs.



Figure 1. Damage sustained to the right front and side of the SUV.

1.2 Weights and Measurements

The crash vehicle was not weighed or measured due to the substantial crash damage. The post-crash measurements would not be an accurate representation of the weights and dimensions of the vehicle. Therefore, published dimensions and weights from a 2015 Nissan Rogue Owner’s Manual were utilized.

OVERALL LENGTH	183.3 INCHES
OVERALL WIDTH.....	72 INCHES
OVERALL HEIGHT WITH ROOF RACK	67.5 INCHES
WHEELBASE	106.5 INCHES
CURB WEIGHT	3,605 LBS.

1.3 Powertrain

The SUV was equipped with a 4-cylinder gasoline engine, a continuously variable automatic⁵ transmission (CVT), and a propeller shaft.⁶ The propeller shaft delivers power to the rear drive axles while the front drive axles are connected directly to the CVT which provides the SUV with all-wheel drive capability.

The engine, CVT, front drive axles, and propeller shaft, which remained connected together as one unit, were separated from the SUV during the crash

⁵ A continuously variable transmission utilizes a two-pully system connected by a chain belt which allows the transmission to change through a limitless number of gear ratios.

⁶ Commonly referred to as a driveline.

sequence. The separated vehicle components traveled about 188-feet from the point-of-impact before coming to rest - **See Figure 2**. The internal components of the engine and transmission were visible in multiple locations due to the broken engine and transmission cases. Most of the plastic covers and connections were broken or missing.

The transmission shifter linkage, which connects the automatic transmission shifter to the transmission control device, was missing. The automatic transmission shifter was examined and found to be stuck in the full-forward or park position. The transmission control device, which is mounted directly to the transmission, controls the hydraulic pressure to the transmission pulleys and belt. The transmission control device was examined and found to be about ¼-inch from the park position.

The powertrain components mounted on axle 2 appeared undamaged. The SUV was equipped with a 14.5-gallon fuel tank. The fuel tank was drained, and it contained between 3 - 4 gallons of gasoline.



Figure 2. Looking at the point-of-rest for the front of the SUV. (Source: Delray Police Department)

1.4 Driver Controls

Most of the driver controls were pushbutton that returned to a neutral position, making it not possible to determine what setting they were at before impact. The steering wheel contained controls for the control panel and vehicle information display and the cruise control set switches. The SUV was equipped with a push-button ignition. The following is a list of available analog switch locations:

- The multifunction stem located on the left side of the steering wheel column had controls for the headlights and turn signals. The headlight selection did have an automatic on position but was found to be in the off position.
- The multifunction stem located on the right side of the steering column had controls to operate the windshield washer/wipers and rear window washer/wiper. The wiper selector was found to be in the off position.
- The automatic transmission shifter was found in the park location.

1.5 Electrical System

The electrical system forward of the engine firewall had been severed. At the crash scene the 12-volt battery was found separated from the vehicle. The plastic battery housing was broken. Due to the extensive damage, no electrical system checks were able to be conducted at the tow yard.

The starter and alternator were removed and sent to NTSB headquarters for testing. Utilizing a 12-volt battery, the starter was tested and found to be operational. According to Nissan Group of North America (Nissan), the vehicle manufacturer, an exemplar vehicle was required to check the functionality of the alternator. No such vehicle was available; testing of the alternator was not performed.

The engine control module (ECM) and transmission control module (TCM) were originally mounted in the engine compartment but were found displaced in the cargo area of the SUV. Both modules were sent to NTSB headquarters for testing, but an exemplar vehicle was required, and none was located. According to Nissan, the modules only provide diagnostic trouble codes, and no data as to their functionality at the time of the crash.

1.6 Steering System

The SUV was equipped with an electrically operated rack and pinion steering system. The rack and pinion steering gear had become separated from both steering knuckles and the vehicle. The steering wheel and steering column remained mounted inside the passenger compartment.

1.7 Suspension System

The vehicle was equipped with independent suspension on both axles. The steering axle had coil-spring struts and upper and lower control arms. The rear suspension consisted of multiple linkages to aid in stability and handling.

The front suspension was no longer attached to the vehicle. Some of the left-side suspension components remained attached to the displaced engine compartment components - **See Figure 3.**

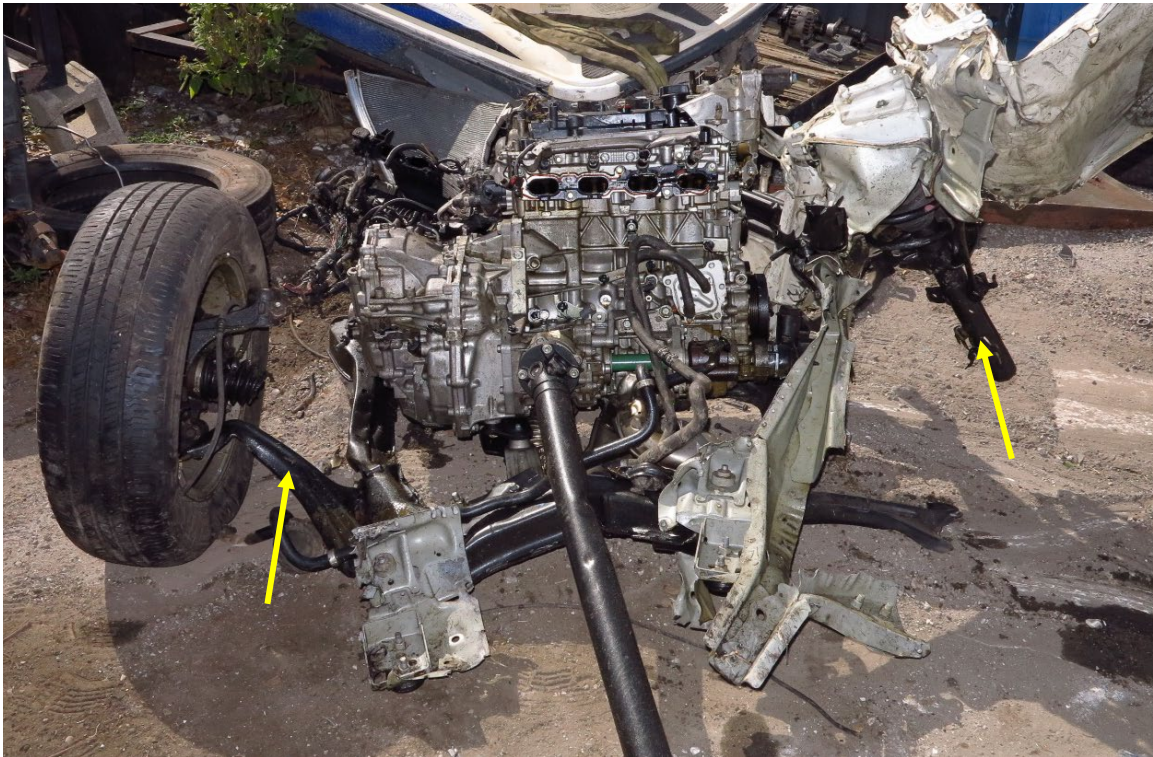


Figure 3. Looking at the engine and front suspension from what would have been the passenger compartment. The yellow arrow on the right is pointing to the coil-spring strut and the yellow arrow on the left is pointing to the lower control arm.

1.8 Brake System

An examination of the brake system components was completed, but due to the extensive damage sustained by the front of the vehicle no brake application testing was able to be conducted. The front of the vacuum brake booster was dented and the hydraulic fluid reservoir for the brake master cylinder was missing. The SUV was stopped at the time of the crash, and no pre-existing defects were discovered. Measurements for the brake linings and rotors are shown in **Table 1.**

Table 1: SUV Brake Information:⁷

Brake Location	Axle 1		Axle 2	
	Left	Right	Left	Right
Brake Type	Disc	Disc	Disc	Disc
Measured Lining Thickness	Inside 8/32	Inside 8/32	Inside 6/32	Inside 7/32
	Outside 7/32	Outside 8/32	Outside 8/32	Outside 7/32
Rotors (inches)	0.998 ⁸	0.990	0.620 ⁹	0.704

1.8.1 Anti-Lock Brake System (ABS)

The ABS sensors and modulators were missing from the steering axle. The sensors and modulators for the rear axle were in place and intact. The ABS warning light could not be checked due to substantial electrical system damage.

1.9 Vehicle Recorded Data

The Delray Beach Police department utilized a Bosch Crash Data Retrieval (CDR) CANPlus tool and software version 23.0 to image the Airbag Control Module (ACM) to attempt to recover any digital crash data from the Nissan. The ACM has the capability to record and store two types of events: Deployment and Non-Deployment events. The ACM did not record any events related to the crash - **See Table 2.**

Table 2: ACM File Information

User Entered VIN	5N1AT2MV7FCXXXXXX
User	C. Reed
Case Number	23001924
EDR Data Imaging Date	02/10/2023
Crash Date	02/08/2023
Filename	23-001924 ROGUE.CDRX
Saved on	Friday, February 10 2023 at 10:40:06
Imaged with CDR version	Crash Data Retrieval Tool 23.0
Imaged with Software Licensed to (Company Name)	Delray Beach Police Department
Reported with CDR version	Crash Data Retrieval Tool 23.0
Reported with Software Licensed to (Company Name)	Delray Beach Police Department
EDR Device Type	Airbag Control Module
Event(s) recovered	None

⁷ All measurements recorded are in inches.

⁸ Wear limit thickness for the front axle is 0.945-inches.

⁹ Wear limit thickness for the rear axle is 0.551-inches.

The Engine Control Unit (ECU) and Transmission Control Unit (TCU) were transported to the NTSB headquarters for further analysis and possible data extraction. According to information provided by representatives of Nissan, the ECU and TCU needed to be installed on an exemplar vehicle to obtain any data. An exemplar vehicle was unable to be located that was suitable to be used as a surrogate for the control units. According to Nissan, if available, the data from the control units would be limited to diagnostic trouble codes.

1.10 Maintenance Records/Recalls

There were no active recalls found in the National Highway Traffic Safety Administration's (NHTSA) recall database for the VIN assigned to this SUV. Additionally, Nissan has no records of warranty or recall repairs.

A maintenance record located that indicated that a recall inspection was conducted on October 14, 2022. NHTSA recall number 22V-024 required that the battery and wiring harness be inspected; both passed inspection and the vehicle was released.¹⁰

NHTSA received a Part 573 Safety Recall Report from Nissan North America, Inc., on January 21, 2022, outlining Nissan's concern regarding the wiring harness. Nissan issued their own recall; number R21B9¹¹.

"If the connector becomes corroded, electrical current may continue to flow between the connector terminals, potentially causing the driver's power seat or power window to become inoperative, AWD warning light illumination, battery discharge, and/or thermal damage to the connector. In the worst case condition, a fire can occur".

E. LIST OF ATTACHMENTS

Vehicle Attachment - Vehicle Examination Photographs
Vehicle Attachment - Part 573 Safety Recall Report
Vehicle Attachment - Vehicle Maintenance Records

Submitted by:
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¹⁰ See Vehicle Attachment - Vehicle Maintenance Records.

¹¹ See Vehicle Attachment - Part 573 Safety Recall Report.