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Special Crash Investigations: Remote Non-Traffic Surveillance Power Window Entrapment Investigation; Vehicle: 2019 Toyota 4Runner; Location: Arizona; Incident Date: October 2021

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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 investigation of the death of a 2-year-old female involved in a power window entrapment incident in a parked 2019 Toyota 4Runner. This incident occurred during the evening in October 2021 in Arizona. The incident site was a private residence where a family was having a social gathering outside their home. The Toyota was parked in the driveway with the windows down. The ignition was switched to the "accessory" position to play music and the driver's door was open. The child had entered the unattended vehicle on her own and was in the second-row right position in the vehicle. The child was found with her head hanging out the right-rear window with the window closed beneath her chin and her hand within reach of the window control. She was removed from the vehicle and transported to a local hospital in critical condition and later died. The medical examiners ruled her death an accident with the primary cause of death being asphyxia.

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Special Crash Investigations
Remote Non-Traffic Surveillance Power Window Entrapment Investigation
Case No. DS21009
Vehicle: 2019 Toyota 4Runner
Location: Arizona
Incident Date: October 2021

Background

This report documents the remote investigation of the death of a 2-year-old female involved in a power window entrapment incident in a parked 2019 Toyota 4Runner (Figure 1). The investigation was intended to determine the events leading up to the incident, actions of the responsible adults, vehicle characteristics and equipment, applicability of the Federal Motor Vehicle Safety Standards (FMVSS) Standard No. 118, Power-operated window, partition, and roof panel systems,[1] environment/scene conditions, and activities of the child occupant. The incident was identified by a Crash Investigation Sampling System quality control center member, and the National Highway Traffic Safety Administration's Research and Rulemaking Office was notified. It was recommended that the Special Crash Investigations (SCI) team conduct an investigation to better understand the implications of the FMVSS No. 118. This standard specifies requirements for power operated window, partition, and roof panel systems to minimize the likelihood of death or injury from their accidental operation. The operating requirements of FMVSS No. 118 are enumerated in paragraph S4 of the standard. They include the fundamental requirement that power windows must not be operable unless the vehicle's ignition switch is in the "On," "Start," or "Accessory" position. The SCI team contacted the police department's violent crimes unit and medical examiner's office to obtain source material and the case was assigned in October 2021. The medical examiner's report was obtained in December 2021, the incident report in January 2022, and the on-scene images in February 2022.

Figure 1. 2019 Toyota 4Runner (police image)

This incident occurred on an evening in October 2021 in Arizona. The incident site was a private residence where a family was having a social gathering outside their home. The 2019 Toyota 4Runner was parked in the driveway with the windows down and the driver's door open. The ignition was switched to the accessory position to play music. The child had entered the

[1] 49 CFR § 571.118, Standard No. 118; Power-operated window, partition, and roof panel systems (2008, July 7). www.ecfr.gov/current/title-49/subtitle-B/chapter-V/part-571/subpart-B/section-571.118

unattended vehicle on her own through the driver's door and was in the second-row right position. The child was found with her head hanging out the right-rear window with the window closed beneath her chin and her left hand within reach of the window control. The mother removed her from the vehicle and then both parents and another adult performed CPR until EMS arrived. She was transported to a local hospital in critical condition and later died. The medical examiners ruled her death an accident with the primary cause of death being asphyxia.

Summary

Incident Site

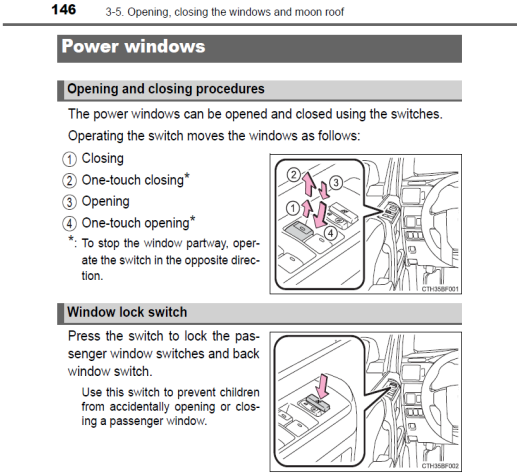
The incident site was the driveway (Figure 2) of a private single-floor residence that was set back approximately 9 m (29.3 ft) from the roadway. The house and roadway were separated by a sidewalk and low metal and brick fence. The house faced north with an undivided city street in front. The front yard was gravel covered and had several small trees, several chairs, and a fire ring. A string of lights illuminated this area. The driveway was to the left of the house (west) and had parking for three vehicles. The driveway was covered by a tan-colored carport canopy with a large light fixture hanging from the frame. The 4Runner was parked under the canopy facing south. It was dark at the time of the incident with the nearest streetlight approximately 30 m (98 ft) east of the driveway. The nearest weather station reported conditions as 26 ºC (79 ºF), light winds, 29 percent humidity, and partly cloudy. An incident diagram and satellite view are included at the end of this report.

Figure 2. 2019 Toyota 4Runner, parked under canopy, facing south (police image)

2019 Toyota 4Runner Description

The 2019 Toyota 4Runner was manufactured in October 2018 with the Vehicle Identification Number JTEBU5JR7K5xxxxxx. The Toyota was a 5-door SUV with seating for five. The Toyota had a 4.0-liter, 6-cylinder gasoline engine, 5-speed automatic transmission, and 4-wheel drive. The Toyota had power windows that could be opened and closed using door-mounted scoop-style switches (Figure 3). Pulling up closes the window, pushing down opens the window, which conforms to safety standards. The driver's door panel had a window lock switch to prevent children from accidentally opening and closing a passenger window. According to the incident report, the window lock button was not engaged. According to the owner's manual the windows had a jam protection function (if an object becomes jammed between the window and the window frame while the window is closing, the window's movement is stopped and the window opens slightly) and a catch protection function (if an object becomes caught between the door and window while the window is opening, the window's movement is stopped). The owner's manual also indicated the jam protection function may not work if something gets jammed just before the window is fully closed. There was additional window functionality

associated with key operation. There were several warnings about jam and catch protection in the owner's manual (Figure 4).



146 3-5. Opening, closing the windows and moon roof

Power windows

Opening and closing procedures

The power windows can be opened and closed using the switches.

Operating the switch moves the windows as follows:

① Closing
② One-touch closing*
③ Opening
④ One-touch opening*

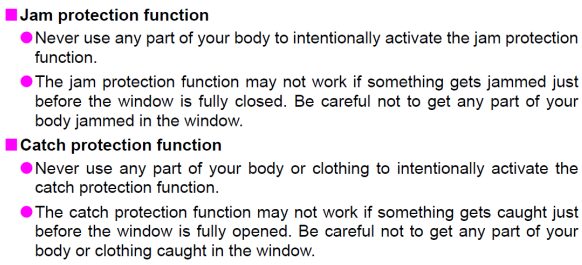
*: To stop the window partway, operate the switch in the opposite direction.

Window lock switch

Press the switch to lock the passenger window switches and back window switch.

Use this switch to prevent children from accidentally opening or closing a passenger window.

Figure 3. Window operation in the 2019 Toyota 4Runner owner's manual



Jam protection function

- Never use any part of your body to intentionally activate the jam protection function.
- The jam protection function may not work if something gets jammed just before the window is fully closed. Be careful not to get any part of your body jammed in the window.

Catch protection function

- Never use any part of your body or clothing to intentionally activate the catch protection function.
- The catch protection function may not work if something gets caught just before the window is fully opened. Be careful not to get any part of your body or clothing caught in the window.

Figure 4. Window operation warnings in the 2019 Toyota 4Runner owner's manual

SCI located an exemplar 2019 Toyota 4Runner and conducted several tests to obtain a variety of measurements. SCI used a digital force push/pull gauge to measure the peak squeezing and pressing forces for the second-row window.[2] A maximum allowable squeezing force of 100 Newtons (about 22.5 lb) is the standard. In each test, the measurement was obtained three times.

The open and auto close button controls were operated during testing. The auto open feature was tested with a rolled towel serving as the window obstruction. The time to close the window was approximately 3 seconds.

Action	Measured three times				
	Pounds-force			Average pounds	Newtons
Button push to lower window	2.00	1.60	1.80	1.80	8.00
Button pull to raise window	0.90	1.30	1.00	1.07	4.75

[2] Baoshishan Digital Force Gauge 500N Push Pull Gauge.

The window controls were operated from the second row. The opening and closing were tested with a single press or pull. The auto close was with a single pull. For the manual close, the window was gradually raised (creep) until the gauge could be placed between the top of the window glass and the window frame.

Action	Measured three times				
	Pounds-force			Average pounds	Newtons
Auto close with auto open	29.70	31.20	26.70	29.20	129.88
Manual close with creep	54.80	54.00	54.00	54.27	240.40

During a follow-up inspection of the Toyota, the police measured the area around the second-row right window as follows.

Top of rear passenger window, from ground:	181 cm (71.5 in)
Bottom of rear passenger window, from ground:	135 cm (53.5 in)
Running board, passenger side:	48 cm (19.0 in)
Inside back seat to bottom of window:	40 cm (16.0 in)
Inside back seat to top of window:	80 cm (31.5 in)
Rear head room (from vehicle specifications):	99 cm (39.0 in)

SCI measured additional areas in and around the rear window.

Top of rear passenger window to bottom window:	40 cm (15.7 in)
Top of rear window to top control panel:	38 cm (14.9 in)
Rear window width:	59 cm (23.3 in)
Bottom of window to top window (auto closed):	18 cm (7.0 in)
Second row armrest size:	34 x 8 cm (13.3 x 3.1 in)
Second row armrest location, below window:	24 cm (9.4 in)
Control button opening:	47 x 23 mm (1.8 x 0.9 in)
Control button size:	30 x 24 mm (1.1 x 0.9 in)
Ground to second row outside handle:	112 cm (44.0 in)
Ground to second row inside handle:	112 cm (44.0 in)
Ground to first row outside handle:	108 cm (42.5 in)
Ground to first row inside handle:	108 cm (42.5 in)
Ground to inside step, front row:	53 cm (20.9 in)
Ground to inside step, second row:	53 cm (20.9 in)

During the follow-up vehicle inspection, the police also took photographs and a child-like doll was placed in the rear passenger window to re-enact what occurred. Photographs were taken to show the possible positioning of the child at the time of the incident. The police were contacted about their efforts and they said they did not come to any conclusion about the jam/catch protection functions for the window.

Incident Circumstances/Situation

The incident occurred at the home of the involved child. There was a birthday party underway for the child's mother that had begun at approximately 1800 hours. The party was taking place in the front yard (Figure 5).

Figure 5. Party area, looking west, subject vehicle in background (police image)

The child's mother was cooking on a grille in the front yard while the 2-year-old played near her. As additional family members arrived she needed to cook more food. The Toyota was owned by the child's father and was parked in the driveway with the windows down. The ignition was switched to the accessory position to play music, and the driver's door was open. The Toyota was a short distance from the party area and its left side would have been visible to partygoers. When the police arrived the vehicle was not running, all the windows were down and both left side doors were open.

The mother reported that the vehicle was turned off and on at different points to preserve the vehicle battery. She reported that there were no children present in the vehicle when the vehicle was being started and stopped. While still cooking she went into the kitchen. This was the last time she saw the 2-year-old before the onset of the incident.

Once the mother finished cooking she began looking around for the child. She looked inside the house and then in the backyard. She then began looking for the child in the carport. The 2-year-old was found with her head hanging out the right rear window with the window closed beneath her chin and her hand within reach of the window control. She did not recall the time between seeing the child last and finding the child in the vehicle. She went to the driver's door, lowered the side window, removed the child from the vehicle and carried her to the grill area. Her sister's husband began CPR. An unknown adult called the police. The police initially responded believing that there had been a traffic accident in the area. The police were dispatched 7 minutes after the call and arrived 11 minutes after the call.

The child's father reported that the only person who saw the child in the vehicle was his wife. He also reported that the last time he recalled seeing the child was inside the home approximately 3 hours earlier. In his interview with police he stated "anything like this could happen if she went into the truck because it had a sensor that detects if someone is in the window and didn't know what's wrong with the vehicle and why the window didn't go down."

Guardian Data

The 2-year-old was the youngest of four children for the 31-year-old mother and 34-year-old father. On the day of the incident, the mother reported that she woke up early and went to the laundry room to wash clothes. She washed the Toyota and then went to a department store to cash a gift card. There were at least six adults present during the incident, including both parents, both grandparents, and other relatives. The grandmother was outside at a table eating and the grandfather was inside the house lying down because he did not feel well. There was an unknown number of children present.

Post-Incident Data

The child was removed from the vehicle by her mother. Several adults attempted CPR before emergency personnel arrived to continue resuscitation efforts. The child was transported to a local hospital in critical condition. She was declared deceased 1 hour 28 minutes after the call notification. Her mother traveled with her in the ambulance and her father followed in a private vehicle. The child died shortly after arrival. The medical examiner's report indicated the cause of death was asphyxia, the manner of death was accident, and how the injury occurred was neck compression by vehicle window.

Window Entrapment Discussion

Based on available information, the 2-year-old child strayed away from the adults at the party and entered the Toyota on her own through an open front door. She was left unattended for an unknown period but several minutes at least. The vehicle was powered on with the key present. Based on the interior height of the vehicle and the child's height it appears likely she was facing the second-row right window on her knees (Figure 6). The child was operating the window switch in an unknown fashion, possibly running it up and down several times with her left hand. Her head was outside of the window. There was evidence in the form of fingerprints that the child's right hand was grasping the upper part of the window (Figure 7). The police photos showed a linear transfer that ran from the top of the window to the bottom. It appears that this streak was created post-incident when the window was raised from the closed position and smeared existing transfers. The incident likely occurred when the child closed the window with her head outside. She may have continued operating the control to extricate herself for a short time before going unconscious.

Figure 6. Second-row right of the 2019 Toyota 4Runner (police image)

Figure 7. Second-row right window of the 2019 Toyota 4Runner with hand and neck print transfers, (police image)

2019 Toyota 4Runner Occupant

Second-Row Right Occupant Deographics

Age/sex:	2 years/female
Height:	104 cm (41 in)[3]
Weight:	18 kg (39 lb)[3]
Eyewear:	None
Seat type:	Bench with folding back
Seat track position:	N/A
Egress from vehicle:	Removed by mother
Transport from scene:	Ambulance
Type of medical treatment:	Transported, treated at hospital before being declared deceased

Additional measurements

Extended fingers to toes:	119 cm (47.0 in)
Right and left arm length:	39 cm (15.7 in)
Circumference of head:	49 cm (19.5 in)
Circumference of neck:	27 cm (10.7 in)
Circumference of chest:	57 cm (22.5 in)
Kneeling height:	79 cm (31.1 in)[4]

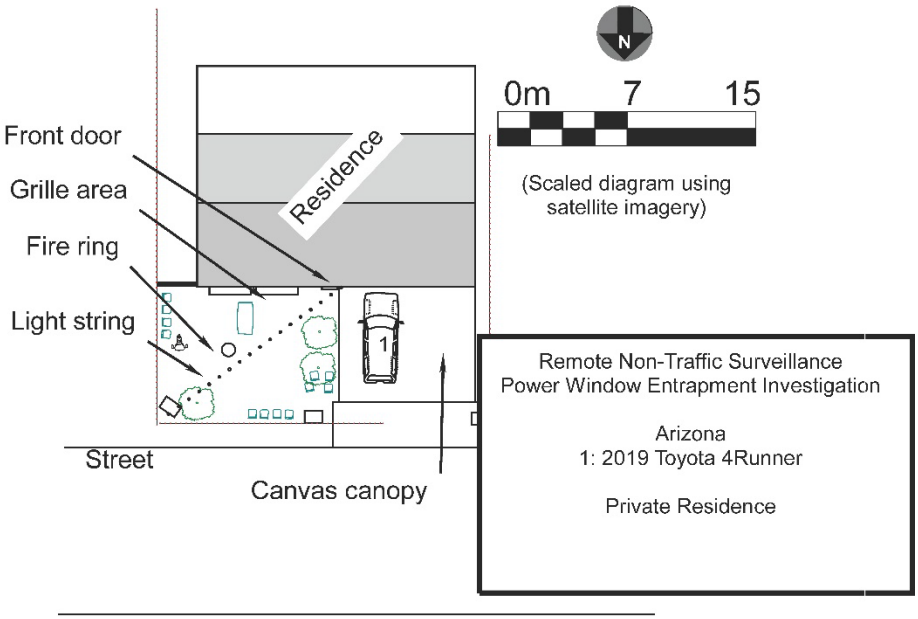
Occupant Injuries

Injury No.	Injury	Injury Severity AIS 2015	Involved Physical Component (IPC)	IPC Confidence Level
1	Asphyxia/suffocation NFS	020000.3	Window/frame	Certain
2	Anterior neck. Two linear abrasions, 3.1 cm (1.25 in) long, 0.30 cm (0.12 in) apart. Anterior left lower neck. Two curved abrasions measuring 2.5 x 0.15 cm (1.0 x 0.06 in) and 1.9 x 0.15 cm (0.75 x 0.06 in)	310202.1	Window/frame	Certain

Source: Autopsy report

[3] Per autopsy report.
[4] Anthropometry of Infants, Children, and Youths to Age 18 for Product Safety Design, SAE SP0450. Calculated using tibial height.

Incident Diagram



Case Number:	DS21009

Satellite View of Incident Site

Image source: Google Maps ©2024 Maxar Technologies

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