

Supplemental Report, DP14-003, EDR Examples

A General Discussion of the Event Data Recorder in the Toyota Corolla: The Event Data Recorder (EDR) is part of the Supplemental Restraint System that records data for some types of collision events for future safety research or crash analysis. The EDR will record data when the vehicle experiences a rapid change in speed that exceeds a specified threshold, above changes in speeds that are considered normal driving use. For example, stopping hard with the brakes would not cause a recording, but hitting a curb may. The system limitations include the fact that different types of data are recorded at different intervals and may not be sufficient to record the entire crash. This limitation means that the data reported for a specific time interval was recorded near that time interval but due to the varying rates of data collection the value noted is not necessarily the *exact* data at the *exact* time marker.¹

All Toyota vehicles equipped with an EDR will record post-crash data. If an impact occurs that has exceeded the rapid change in the speed threshold (called a “collision trigger”) the EDR system will begin to record data for varying lengths of time depending on the parameters it is capable of recording. Not all Toyota models have an EDR capable of recording pre-crash data. On the models that do have pre-crash recording capability the EDR will also record about 5 seconds of data that took place before the collision trigger.

EDRs were first introduced into the Toyota Corolla during model year (MY) 2005. From MY 2005 to MY 2008 the Corolla EDR only recorded post-crash data. Beginning with MY 2009 the EDR recorded both post-crash and pre-crash data.

In ODI’s analysis of the Vehicle Owner Questionnaires (VOQs) submitted with, and in support of, the petition, objective evidence from event data recorders was analyzed, in conjunction with any supporting or additional information (e.g., law enforcement crash reports, repair orders from dealers or independent repair facilities, photographs, interviews with complainants and/or complainants’ families [3 complainants were now deceased and in some cases the complainant was not the driver at the time of the incident], witness statements, letters to elected representatives, field inspections by insurance companies or manufacturer representatives, letters to NHTSA, etc.). What follows is a more detailed examination of those complaints.

Table 1 below shows an EDR download of the pre-crash data from a MY 2010 Corolla for a crash reported to ODI by Vehicle Owner Questionnaire (VOQ) 10344874, one of the VOQs submitted by the petitioner as an example that “unsafe and unexpected engine surges can occur even when the driver’s action is to apply the brake.” The complainant in VOQ 10344874 alleged that she was pulling into a driveway at 3 mph and that when she applied the brake pedal the vehicle all of a sudden accelerated causing a collision with an iron rod fence. In Table 1, Time is measured in seconds prior to the collision trigger (e.g., -5.0 seconds), noted at 1 second intervals. At this time interval the values listed are the most recently captured data values and not necessarily the value at that exact moment. The Accelerator Pedal position is measured in voltage (0.78 volts equals idle, maximum application is 3.79 volts). Engine

¹ “The Vehicle Speed is based on the front wheel speed sensors and recorded in 2 kph increments and nominally updated every 500 ms [milliseconds: 500 ms equals 0.5 seconds]. The Brake Switch, based on the stop lamp switch status, is either ON or OFF, and is updated instantly. The service brake pedal must be depressed minimally for the stop lamp switch to activate. The accelerator pedal position is recorded in 0.039 volt increments, and the value is nominally updated every 524 ms. This measurement is taken directly at the operator’s accelerator pedal. The Engine RPM is measured in 400 RPM increments [rounding down] and is nominally updated every 524 ms.” (Toyota Motor Corporation, *Response to Information Request DP14-003: 2010 Corolla EDR Design*, page 8)

is measured in RPM (in increments of 400 rpms, rounded down (e.g., 799 rpm would be reported as 400: 800 is approximately idle). The Brake data indicates whether the brake pedal was depressed or not (either On or Off). Brake data is the only data that is recorded at exactly the time interval indicated. This is due to the fact that the information on the brake position is carried on a different signal path and can be recorded instantly while the other values (speed, rpm, accelerator pedal position) are all traveling together on the same path (but not the same signal path as brake information) in a sequence and are not recorded simultaneously.²

VOQ: 10344874 2010 Corolla				
Time: Seconds Prior	Speed: MPH	Engine RPM	Accelerator Pedal Voltage	Brake Pedal
-5.0	6.2	800	0.86	OFF
-4.0	6.2	800	0.86	OFF
-3.0	6.2	800	0.78	OFF
-2.0	6.2	800	0.82	OFF
-1.0	9.9	2400	3.48	OFF
-0.1	17.4	3200	3.75	OFF

Table 1. Pre-crash data VOQ 10344874

The pre-crash data in Table 1 shows that at 5 seconds prior to the collision trigger (-5.0) the vehicle was traveling at 6.2 mph with a slight accelerator pedal application; at -3.0 seconds the accelerator pedal is recorded as being released (goes to idle at 0.78); at -2.0 seconds the accelerator pedal is recorded as being depressed; and at -1.0 seconds the speed is recorded as increased, the engine rpm has increased and the accelerator pedal is being applied full throttle, which continues until the collision trigger 0.9 seconds later (at -0.1). **According to the EDR download, the brake pedal was never applied and at the time of impact the accelerator pedal is fully down.** Although the complainant’s perception of the incident was that she was applying the brakes with force, the EDR pre-crash data indicates that she was mistakenly applying the accelerator pedal and, in fact, never applied the brake pedal. This type of event is classified as Pedal Misapplication.

Some of the VOQs submitted by the petitioner have associated EDR downloads with pre-crash data that can provide insight into what occurred with the brakes, accelerator pedal pressure, and vehicle speed for up to 5 seconds prior to the time of the collision trigger (if it was on a model year 2009 or later Corolla). This information can be compared to the driver’s perception of the events along with law enforcement crash reports, insurance claim information, complainant interviews, or other relevant information.

Table 2 is an example of Pedal Misapplications that can occur in the middle of an event, using for example, one of the VOQs (10507434) submitted by the petitioner in support of his claim that, “unsafe and unexpected engine surges can occur *even when the driver’s action is to apply the brake* [Italics added].” The description of this event, as reported in the VOQ and to Toyota, is:

“While at a stop with the brakes depressed, the vehicle accelerated and the contact crashed into the wall of a private residence. The contact sustained injures to the right leg and the front passenger sustained a sprained back muscle. . . My wife was parking our vehicle. She was *moving slowly forward with her foot on the brake.* [Italics added] |

² For additional information on understanding Toyota’s EDR data see *Event Data Recorder – Reference Document* in the public repository for this investigation at www.safercar.gov.

actually observed her foot on the brake from my right seat position. Suddenly as she was moving forward with her foot on the brake and the shift in drive the vehicle just lunged or surged forward and impacted a 2 story home.”

VOQ: 10507434 2013 Corolla				
Time: Seconds Prior	Speed: MPH	Engine RPM	Accelerator % Full Throttle	Brake Pedal
-4.75	1.9	1200	6.0	OFF
-4.25	1.9	1000	10.5	OFF
-3.75	2.5	1000	10.0	OFF
-3.25	2.5	1100	8.5	OFF
-2.75	2.5	1100	10.0	OFF
-2.25	3.1	1300	20.5	OFF
-1.75	5	1700	0.0	OFF
-1.25	6.2	1800	79.0	OFF
-0.75	8.1	1900	100.0	OFF
-0.25	9.9	2300	100.0	OFF
0 (trigger)	12.4	2400	99.5	OFF

Table 2. EDR download VOQ 10507434

This newer model year 2013 EDR version of the data shows % throttle apply instead of voltage and recordings at every ½ second. The EDR data shows that around -1.75 seconds before the collision trigger the accelerator pedal was released, going to 0%; at -1.25 the accelerator pedal was being applied aggressively, at 79%, as the driver mistakenly applies the accelerator instead of the brake. At -0.75 seconds before the trigger the accelerator pedal was 100% down, as the driver presses harder on what she believes is the brake pedal. At no time in the 4.75 seconds before the collision trigger was the brake applied.

The complainant in VOQ 10507434 noted that he [thought] he was able to observe her foot on the brake pedal from his position in the passenger seat. As indicated by the EDR download the acceleration event started when the driver’s foot has released the accelerator pedal with less than 1.75 seconds before impact, which is a short time for a passenger to be able to realize what is occurring, and then look over to observe the driver’s foot position. Testing was done at NHTSA’s Vehicle and Research Testing Facility (VRTC) as to visibility of the driver’s foot from the front passenger seat of the subject vehicle. Figure 1 is a photo taken from the front passenger seat looking towards the driver’s footwell. From the position of the passenger (who is sitting upright, not leaning toward the driver, with the seat in the rearmost position) it is difficult to ascertain which pedal the driver’s foot is on.



Figure 1: View from passenger seat of driver's footwell.

Some Pedal Misapplications can occur early in the event with sustained pedal error throughout. Table 3 shows the EDR download from VOQ 10479582, submitted by the petitioner. The description of the event, as reported by the complainant to Toyota's customer hotline is:

"While parking the vehicle, it suddenly accelerated crashing into the back of a house. The owner/driver reported that as she was slowly maneuvering into a parking space, the vehicle suddenly accelerated, causing her to lose control, resulting in the vehicle traveling through a chain barrier. The vehicle reportedly continued to travel across a roadway and collided into a building structure. The owner/driver reported *she continued to depress the brake pedal in an attempt to slow/ stop the vehicle, however the brakes were ineffective.* [Italics added]"

VOQ: 10479582 2010 Corolla				
Time: Seconds Prior	Speed: MPH	Engine RPM	Accelerator Voltage	Brake Pedal
-4	9.9	2000	1.02	OFF
-3	17.4	3600	3.75	OFF
-2	18.6	3600	3.75	OFF
-1	24.9	4800	3.75	OFF
0 (trigger)	47.2	4800	3.36	OFF

Table 3. EDR download 10479582

The EDR download shows that from -4 seconds to the collision trigger the vehicle accelerated from 9.9 mph to 47.2 mph, and that from -3 seconds the accelerator pedal was full throttle. The brake pedal was

never applied, although in the driver's perception the brake pedal was fully depressed and the brakes were ineffective.

Some Pedal Misapplications can occur with a pedal error very late in the event timeline. Table 4 shows the EDR download from VOQ 10551478, submitted by the petitioner. The description of the event from the VOQ is:

While trying to park in my residential apartments. . . (at a speed of 3-5 mph), *applied the brakes and all of a sudden it caused an unintended acceleration* [Italics added] and I hit the huge metallic trash bins in front of me at a very high speed. . . The airbags did not deploy, but the front of my car got damaged heavily. . . We have been in a state of utter shock and dismay since this incident as this was completely unexpected. I have been a safe driver since the past 7 years and have never had any accidents, violations etc. Also I never mistook the gas pedal for the brake during my whole driving career and I use only one leg for this purpose.

VOQ: 10551478 2010 Corolla				
Time: Seconds Prior	Speed: MPH	Engine RPM	Accelerator Voltage	Brake Pedal
-5	5	800	0.78	OFF
-4	5	800	0.78	OFF
-3	5	800	0.78	OFF
-2	5	800	0.78	OFF
-1	8.7	2000	0.78	OFF
0 (trigger)	17.4	2800	3.79	OFF

Table 4. EDR download VOQ 10551478

The EDR shows that there was no application of brake pedal. This is an example of the EDR data being collected at different intervals during the one second time gaps as one can see that at the -1 second mark the accelerator pedal data was collected just prior to the driver mistakenly apply the accelerator instead of the brake pedal. This is evident because the rpm and vehicle speed have increased from the -2 to -1 data points, information collected just after the accelerator pedal was mistakenly applied. At the collision trigger 0 point the pedal is wide open throttle, indicating that the pedal was fully applied by the driver, believing it to be the brake pedal. When reading the EDR data one must remember that the data displayed for the particular time interval, in this example the -1 second mark, are the most recent data reportings and not the immediate, at-that-moment data values, and there can be a apparent mismatch of values (referred to as asynchronous data collection). Only the brake position is the exact value for that moment. One must read the EDR downloads as a flow of information and must take into account the description of the crash and any other additional relevant information. In this example the key piece of information is that the driver said he applied the brake, but the data shows the brake was not applied, that the accelerator was wide open at the very end of the event.

Listed below are some additional EDR download data tables from crashes within the group of VOQs submitted by the petitioner, with associated excerpts from VOQ text, complaint information made to Toyota, or from ODI interview notes with the complainant:

VOQ: 10334936 MY 2010 Corolla				
Seconds Prior	Speed	Engine	Accelerator	Brake
-5.0	31.1	3200	3.59 (FULL)	OFF
-4.0	38.5	3600	3.79 (FULL)	OFF
-3.0	41.0	4000	3.79 (FULL)	OFF
-2.0	47.2	4000	3.79 (FULL)	OFF
-1.0	39.8	3600	3.79 (FULL)	OFF
-0.1 (trigger)	36.0	3200	3.63 (FULL)	OFF

Table 5. EDR download VOQ 10334936

Table 5:

Excerpt: As he pulled up to a stop sign and applied the brakes to slow down and then the vehicle accelerated . . . it traversed the intersection, went across the road, into a parking lot and crashed into a chain link fence. The contact suffered back injuries.

Analysis: The EDR shows that there was no application of brake pedal and that the accelerator pedal was mistakenly fully applied for at least 5 seconds prior to the collision trigger.

VOQ:10597296 MY 2010 Corolla				
Seconds Prior	Speed	Engine	Accelerator	Brake
-4.9	3.7	800	0.82	OFF
-3.9	3.7	800	0.82	OFF
-2.9	3.7	400	0.82	OFF
-1.9	6.2	1200	1.33	OFF
-0.9	12.4	2400	3.32	OFF
0 (trigger)	12.4	2000	0.78	OFF

Table 6. EDR download VOQ 10597296

Table 6:

Excerpt: While parking, there was a sudden increase in engine rpms as the vehicle suddenly accelerated. The accelerator pedal also sank to the floor board. *The contact depressed the brake pedal with force. However, the vehicle continued to accelerate* [Italics added] and crashed into a parked vehicle. The contact suffered injuries to the back . . . She was in the process of making a U-turn [more likely a Three-Point Y-turn], she had backed the car up and just shifted out of reverse and into drive. The car suddenly accelerated like the gas pedal was stuck. She lost control of the car and it collided with a vehicle that was parked on the street.

Analysis: The EDR shows that there was no application of brake pedal and that the accelerator pedal was mistakenly fully applied.

VOQ: 10523677 MY 2010 Corolla				
Seconds Prior	Speed	Engine	Accelerator	Brake
-5	19.9	1200	1.02	OFF
-4	21.1	1200	0.78	OFF
-3	21.1	1600	1.68	OFF
-2	24.9	4000	3.4	OFF
-1	31.1	5200	3.79	OFF
0 (trigger)	28.6	2400	3.79	OFF

Table 7. EDR download VOQ 10523677

Table 7:

Excerpt: The contact stated that while sitting idle, the vehicle suddenly accelerated. The contact was unable to stop the vehicle until it crashed into a ditch. The contact stated that the engine was still running, the rpms were high and the tires were spinning after the incident . . . Customer states mother was driving the vehicle. States mother does not drive the vehicle very often. States mother was at intersection when vehicle took off on its own while brake was being pressed. States the vehicle lunged forward and side swiped a tree.

Analysis: The EDR shows that there was no application of the brake pedal, varying pressure on the accelerator pedal, full throttle at time of impact. The EDR vehicle speed recording indicates that the vehicle was probably approaching the intersection, not sitting at idle, when the wrong pedal was applied.

VOQ: 10352668 MY 2010 Corolla				
Seconds Prior	Speed	Engine	Accelerator	Brake
-4	11.2	2000	2.54	OFF
-3	16.2	2400	2.38	OFF
-2	14.9	2400	2.38	OFF
-1	5	2000	2.46	OFF
0	12.4	2400	2.42	OFF
0 (trigger)	12.4	2400	2.42	OFF

Table 8. EDR download VOQ 10352668

Table 8:

Excerpt: When he depressed the brake pedal, the vehicle suddenly accelerated. He was going to Home Depot, was parking in a parking space, put his foot on brake to put it in Park but it went into Reverse and the engine started to roar and the car took off backwards. Lasted 3 to 4 seconds, went back so fast he spun around twice and hit another parked car, which caused the car to stop.

Analysis: The EDR shows that there was no application of the brake pedal and that there is varying pressure on the accelerator pedal.

VOQ: 10578871 MY 2010 Corolla				
Sec	Speed	Engine	Accelerator	Brake
-4.8	1.2	400	0.86	OFF
-3.8	1.2	400	1.02	OFF
-2.8	2.5	800	1.09	OFF
-1.8	6.2	2000	2.54	OFF
-0.8	12.4	2400	3.16	OFF
0 (trigger)	18.6	2400	3.13	OFF

Table 9. EDR download VOQ 10578871

Table 9:

Excerpt: While driving 5 mph, the vehicle accelerator pedal became stuck which made her lose control and crash into another vehicle. . . While backing out of a parking spot, driver lightly pressed on the accelerator pedal when suddenly the vehicle went out of control, accelerated in reverse.

Analysis: The EDR shows that there was no application of the brake pedal, a slight apply of the accelerator pedal -4.8 seconds before impact with increasing pressure on the accelerator until time of impact.

VOQ: 10534094		MY 2010 Corolla		
Sec	Speed	Engine	Accelerator	Brake
-5.0	44.7	1600	1.05	OFF
-4.0	43.5	1600	1.17	OFF
-3.0	43.5	1600	1.09	OFF
-2.0	43.5	1600	0.90	OFF
-1.0	36.0	1600	0.78	ON
-0.2 (trigger)	26.1	800	0.78	ON

Table 10. EDR download VOQ 10534094

Table 10 (a study in complaint text):

Excerpt: The complaint filed with NHTSA reads, “While stopped with the brake pedal depressed, the vehicle accelerated independently and crashed into a tree. The driver of the vehicle was transported to the hospital via ambulance for treatment of injuries to the jaw. The vehicle was destroyed.”

Customer version of incident to Toyota: “Caller states (caller is not the driver) her daughter was driving the vehicle @ 10:30 PM about 30 -35 MPH, daughter said she took her foot OFF the accelerator pedal to slow down to take a curve in the road. Driver not sure if she applied the brakes. Vehicle left road and hit some bushes first and then struck a tree. Customer's daughter stated she experienced unintended acceleration as she was driving on a local Rd.”

Analysis: Two very different versions of the crash are presented to two different sources. In order to understand the event better ODI obtained an accident report from the responding law enforcement agency. Based on the report, the surface conditions are wet (research on historical weather data indicates there had been a light rain most of the day and into the evening), there is no roadway lighting or street lamps, and there is a sharp curve to the right at the location of the crash. The posted speed limit is 35 mph. At -5.0 seconds prior to the crash the vehicle is 10 mph over the posted limit and the accelerator pedal pressure remains relatively steady until around -2.0 seconds prior to impact. At -1.0 seconds prior to impact the brake is ON. It appears from the accident report diagram and aerial photo mapping of the crash site that the brakes were not applied until the vehicle left the roadway, failing to negotiate the curve in the dark, traveling some distance over undeveloped wet ground until striking a tree in a forested area. See Figure 2.



Figure 2. Red arrow indicates direction of travel, red X indicates approximate crash site.

The above VOQ, 10564094, is an example of how the text of the VOQ complaints cannot be taken as a sole source of information and, whenever possible, the investigator should attempt to obtain additional relevant information in order to form a more complete understanding of what occurred. Below are a few examples (from model year Corollas that did not have pre-crash data on the EDR) also taken from VOQs submitted by the petitioner in support of his allegation that, "that unsafe and unexpected engine surges can occur even when the driver's action is to apply the brake," that show how additional information can enhance an understanding of what occurred during the incident.

VOQ 10566370, MY 2006 Corolla:

Excerpt: While at a complete stop, the vehicle erroneously accelerated and the contact crashed into a pole followed by another vehicle . . . Was stopped at a red light, and shifted to park, when the light changed green, she shifted to drive, and the vehicle suddenly accelerated.

Analysis: In a later statement to Toyota the husband states that the wife's vehicle was struck by a vehicle that was approaching the stop and failed to apply its brakes, crashing into the wife's car and sending it forward, which apparently she was unaware of when she filed the VOQ as she had blacked out at impact and had been transported to a hospital. There was no unintended acceleration event.

VOQ 10322163, MY 2006 Corolla

Excerpt: (from VOQ) [85 year old man] was driving approximately 10 mph in a parking lot. Unexpectedly, the vehicle accelerated and crashed into five parked vehicles.

Analysis: The driver was unavailable for an interview having since passed away; however, the law enforcement accident report indicates that the driver states that his shoe was caught in the accelerator. His statement to Toyota indicates that the focus of his concern and complaint was that the air bag deployed but did not inflate, not a claim of unintended acceleration.

VOQ 10482133, MY 2006 Corolla

Excerpt: While stopped at a traffic light with the brakes applied, the vehicle abnormally accelerated and crashed into another vehicle. The passenger of the second vehicle sustained neck injuries as a result.

Analysis: The driver's statement to the law enforcement officer completing the accident report was that her foot slipped off the brake pedal and hit the accelerator. She told the officer that perhaps she shouldn't wear flip-flops when driving. The VOQ, alleging unexplained unintended acceleration beyond her control, was filed after she was notified by the insurance company of the other party that she was determined to be 100% at fault.

VOQ 10336649, MY 2007 Corolla:

Excerpt: While pulling out of a driveway on a small incline, the contact depressed the brakes and the vehicle abnormally accelerated. The contact was able to stop the vehicle by applying both feet to the brake pedal and placing the vehicle into neutral. The consumer stated on four occasions, she experienced sudden acceleration.

Analysis: The vehicle had an aftermarket floor mat *and* a bathroom rug in the driver's footwell that was interfering with the pedals, reducing braking pedal force and transferring it to the accelerator pedal. Once those were removed and the proper mat was installed the problem did not reoccur.

VOQ 10361254, MY 2007 Corolla

Excerpt: While driving at a very low speed with pressure being applied to the brake pedal the accelerator pedal involuntarily depressed and the vehicle surged forward. *She applied heavy pressure to the brake pedal* [Italics added] but the vehicle continued to lunge forward causing a crash . . . car revved and screamed and the brake did not have any affect in slowing the car, it surged forward and hit a pole .

. . . she had her foot on the brake *and she knows she had her foot on the brake because it left skid marks on the pavement which must have been from the brakes* [Italics added].

Analysis: Reviewing photographs of the crash shows that the “skid marks,” which theoretically proved the application of braking, are coming from the front wheels. The Toyota Corolla is a front wheel drive vehicle, which means it is impossible for the front tires to be rotating and surging the vehicle forward and, at the same time, be dragging because the brakes are applied. The “skid marks” are actually “burnout” marks caused by the front wheels spinning because the accelerator is being applied fully as the vehicle is crashing into the pole. This is a common misperception; if the skid marks were from the brakes causing the tires to drag then the marks would be from the rear tires, not the front.

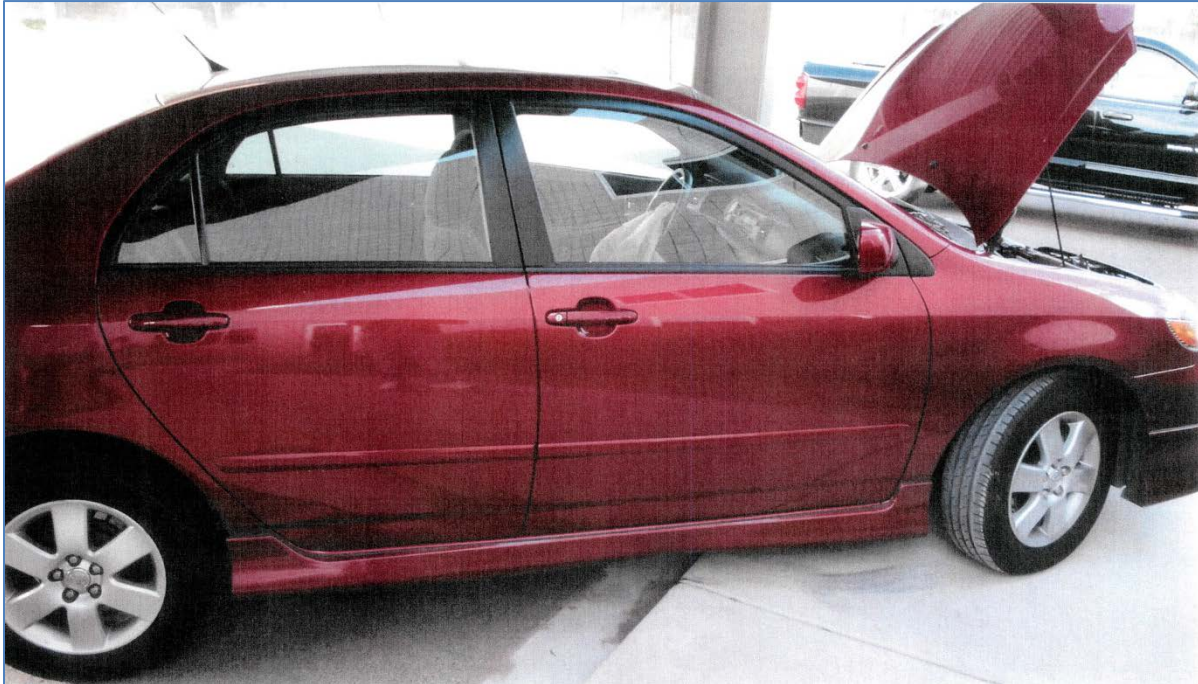


Figure 3. “Burnout” mark visible directly behind front right tire.

VOQ 10494568, MY 2007 Corolla

Excerpt: While driving at low speeds, the accelerator pedal seized without warning. The driver was unable to stop the vehicle and crashed into three parked vehicles in the process . . . the owner states that his daughter was pulling into a parking spot, she put the vehicle into reverse to straighten up the tires to go into the space, she then put the vehicle back into drive and the vehicle accelerated. He states that she did apply the brakes but the accelerator stuck.

Analysis: (from an interview with the daughter by a Toyota field investigator) The driver was a high school student returning to the school parking lot at lunch time; as she was parking she shifted into drive and then pushed down on the accelerator pedal to go forward but the vehicle took off a lot faster than she was expecting. When asked if she applied the brake, she stated, “No, I did not have time to press the brake.”

Summary: The presence of pre-crash EDR data allows a greater level of scientific information to be applied in assessing and understanding the causes of these types of events, as noted by the National

Transportation Safety Board (NTSB) in their analysis of a horrific crash that occurred in July, 2003.³ On July 16, 2003, a 1992 Buick LeSabre, driven by an 86-year-old male, was approaching the intersection of Fourth Street, in Santa Monica, Los Angeles County, California and struck another vehicle, continued through the intersection, and drove through a farmers' market, striking pedestrians and vendor displays before coming to rest. As a result of the crash, 10 people were fatally injured, and 63 people received injuries ranging from minor to serious.

The NTSB determined that the probable cause of this crash was the failure of the Buick driver to maintain control of his vehicle due to his unintended acceleration. In the Conclusions and Findings of their report, the NTSB stated in some of their recommendations:

3. The accident driver made an error in response execution, inadvertently accelerating when he intended to brake, that resulted in the collision with the [other vehicle].
4. The accident driver failed to detect his error in response execution, thereby inadvertently accelerating his vehicle and propelling it through the Santa Monica Certified Farmers' Market.
5. The accident driver most likely reverted to the habitual response of hard braking . . . as his stress level increased and the vehicle failed to slow, but because his foot was on the accelerator rather than the brake pedal, this response led to increased acceleration.
- . . .
11. Had the accident vehicle been equipped with an event data recorder, *a significantly higher level of science could have been applied to assessing and understanding the driver's behavior, as well as its contribution to this accident and the broader issue of unintended acceleration* [Italics added].

ODI has investigated unintended acceleration events since 1978. It has also so utilized outside sources to help with such investigations including NASA and the National Research Council of the National Academy of Sciences (NAS). In the 2012 NAS published *Transport Research Board Special Report 308, The Safety Promise and Challenge of Automotive Electronics, Insight from Unintended Acceleration*. The report noted that the:

“Investigators did observe that a large portion of the consumer complaints involved acceleration occurring at the same moment as the reported occurrence of brake failure. The investigators were unable to identify any combination of malfunctions in the vehicle that could create such a simultaneous failure of two independent systems without leaving physical evidence, especially in the brakes.”

³ National Transportation Safety Board, *Rear-End Collision and Subsequent Vehicle Intrusion Into Pedestrian Space at Certified Farmers' Market Santa Monica, California, July 16, 2003: Highway Accident Report NTSA/HAR-04/04: PB2004-916204, Notation 7649B*.