ENGINEERING ANALYSIS (EA19-002) CLOSING REPORT

SUBJECT VEHICLES: Model Year (MY) 2013-2018 Nissan Altima

SUBJECT: Rear Suspension Control Arm Failure

INVESTIGATION: EA19-002 **DATE OPENED:** 07/29/2019 **DATE CLOSED:** 06/16/2025

BASIS: This Engineering Analysis was upgraded from Preliminary Evaluation (PE) 18-013 based on the Office of Defects Investigation's (ODI) review of Vehicle Owner Questionnaire (VOQ) reports and Nissan's information request letter response data.

ALLEGED DEFECT: The rear lower control arm, which Nissan calls the lower spring link, of the rear suspension system may separate from the chassis due to corrosion. A full separation of the lower control arm from the chassis may lead to a loss of vehicle directional control, increasing the risk of crash and/or injury.

DESCRIPTION OF COMPONENT: For the purposes of conducting this investigation, ODI considered all left and right side rear lower control arms (lower spring links) used in 2013-2018 Nissan Altima vehicles. The rear lower control arm is connected to the vehicle at three different locations and attaches the spring coil to the vehicle. The front attaches to a bracket that bolts onto the steering knuckle and rear suspension cross member assembly. In the rear it is also attached at the steering knuckle and towards the rear suspension cross member assembly, a collar mounts the control arm to the cross member at the inside toe adjustment bolt connected by a bushing as shown in *Figures 1* and *2* below.

Figure 1. Subject Component - Rear Lower Spring Link

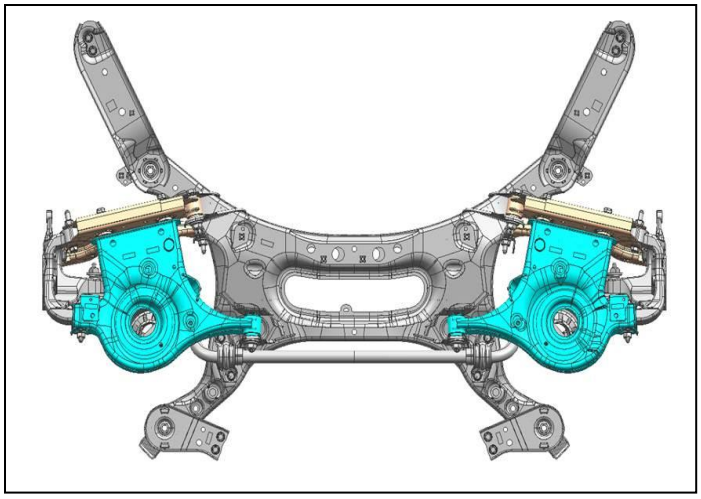

Figure 2. Rear Lower Spring Links and Rear Suspension Cross Member Assembly

CORRESPONDENCE: During the investigation, ODI sent the following information requests to Nissan (*Table 1*).

NHTSA to MFR	MFR to NHTSA
7/24/2020	9/18/2020
9/27/2023	12/19/2023

Table 1. Correspondence

VEHICLE POPULATION: Nissan produced 2,038,307 subject vehicles for the United States (*Table 2*).

Model Year	Altima	Maxima
2013	361,800	-
2014	281,073	-
2015	468,053	-
2016	268,390	72,002
2017	265,482	89,284
2018	187,848	44,375

Table 2. Vehicle Production

PROBLEM EXPERIENCE: At the time of this report, ODI has directly received 322 consumer complaints and an additional 1,035 reports consumers made to Nissan alleging rear lower control arm failures in the subject vehicles. Consumers have reported experiencing an abnormal sound or vibration coming from the vehicle when a failure has occurred. In some cases, complaints reported the vehicle driver being startled and momentarily losing vehicle control. Because of the sound and abnormal vibration, it is very evident to vehicle occupants if a failure has occurred in either the driver or passenger side. In most cases, the consumer continues driving the vehicle after the failure occurs. NHTSA is not aware of any crashes in the consumer reports. A small number of the consumer reports mentioned near crashes, and only one mentioned the affected vehicle making physical contact with another object, bumping into the trailer hitch of a truck. The majority of the reports occurred in salt-belt states with vehicles averaging over 113,000 miles at the time of failure. No injuries have been reported.

FAILURE/WARRANTY DATA: In October 2019, Nissan conducted service campaign P93240 on 2013 Nissan Altima in salt-belt states, as a field parts collection activity. 47,042 repairs associated with service campaign P93240 were reported during the process of this investigation. Nissan has extended a 36 month/36,000-mile warranty coverage on rear lower suspension links for all 2013 Nissan Altima vehicles in non-salt belt states, all 2014-2018 Nissan Altima, and all 2016-2018 Nissan Maxima. The affected vehicles will now be provided an additional 84 months and unlimited mile warranty for a total of 120 months and unlimited mile coverage.

ODI and Nissan complaint and field data identified report counts (*Table 3*).

Problem Experience	EA Opened		EA Closed		Total
	ODI	MFR	ODI	MFR	
Complaints:	91	48	322	1035	1271
Crashes/Fires:	1	0	0	0	0
Injury Incidents:	0	0	0	0	0
Fatal Incidents:	0	0	0	0	0
Other:	0	0	0	0	0

Table 3. Failure Reports

The manufacturer report counts shown above were received by Nissan prior to December 19, 2023 (the date of Nissan's most recent information request response). Reports associated with service campaign P93240 were not included in the failure reports. The reports show a generally declining trend over the last few years in all models and model years, with model years 2013-2015 appearing to experience majority of the field incidents, as shown in *Charts 1* and *2* below.

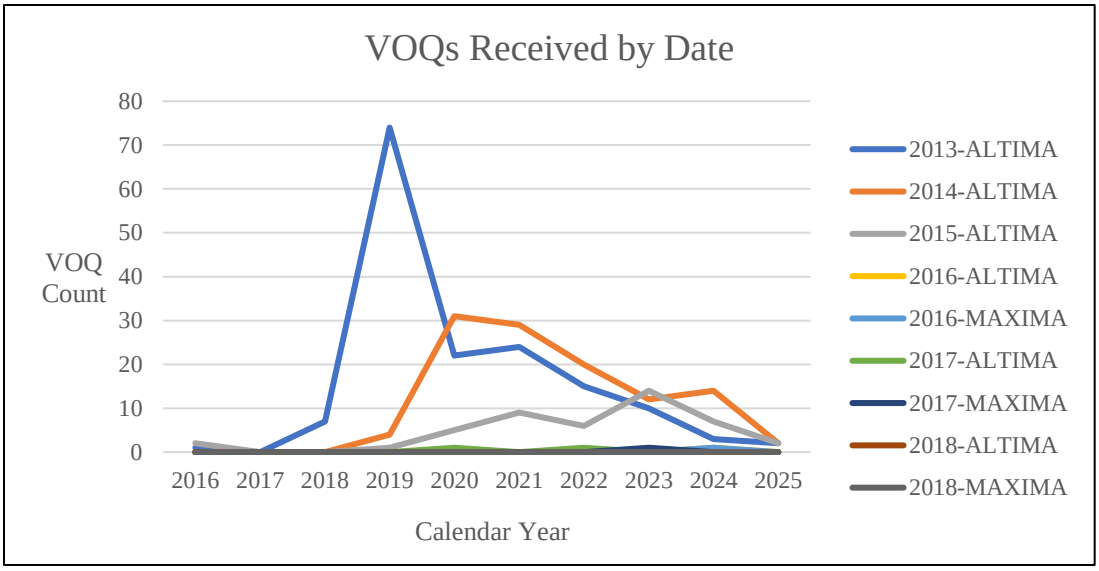

Chart 1. VOQ Reports

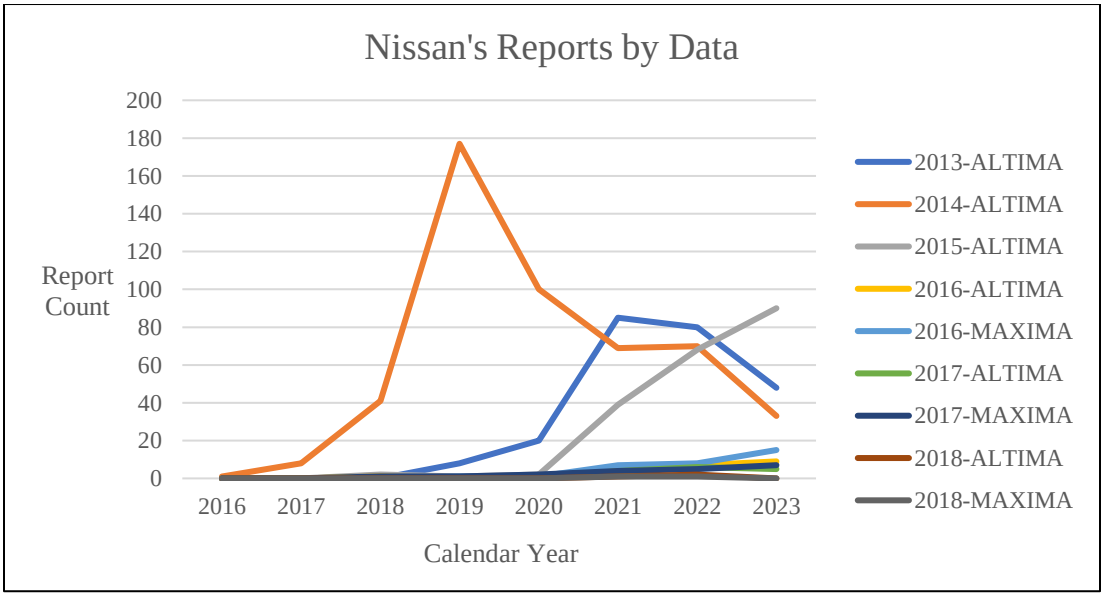

Chart 2. Nissan Reports

DESIGN, MATERIAL, AND PRODUCTION MODIFICTIONS: Nissan implemented a design change on January 11, 2018, to improve the durability of the lower control arm and provided an analysis indicating that the design change resulted in significant improvement to its durability. A double bead weld was used at the location of the bushing at the end of the control arm collar. Nissan reported durability bench test improved by more than 5 times.

TESTING/SIMULATIONS: Severe dynamic driving tests were jointly conducted by NHTSA's Vehicle Research and Test Center (VRTC), Transport Canada (TC), and Nissan North America at the Nissan Technical Center Arizona Proving Grounds (NTCA) in November 2019. Straight Line Braking, Consumer Union Short Course Double Lane Change (CUSC), and Federal Motor Vehicle Safety Standard (FMVSS) No. 126 - Electronic Stability Control Systems criterion tests were performed to assess the failure mode and potential safety consequences of the alleged defect. The two test vehicles used during this testing were a 2013 and 2018 MY Nissan Altima, both equipped with a mechanism to simulate separation of the rear lower spring link by removing a pin pneumatically at the failure point observed in the field.

Initial base-line testing took place to have a reference point of performance on both vehicles. Both vehicles were located in and recovered from salt belt-like environments. At pre-test inspection, the 2013 MY vehicle had visible corrosion at the bushing and point of simulated pin separation (Figure 3). The 2018 MY vehicle had little to no visible corrosion at the bushing area, but some of the control arm collar appeared to have some discoloration that could be early signs of metal oxidation (*Figure 4*).

Figure 3. 2013 Nissan Altima Pre-Test Inspection

Figure 4. 2018 Nissan Altima Pre-Test Inspection

The straight-line brake tests were conducted at 55kph and 100kph using two failure scenarios. One without a pin at the start of testing and two with the pin removed during the test before the brake application. Neither vehicle contacted nor departed from a row of cones (representing a typical highway lane width) and both vehicles were able to stop with the highest steering angle observed at 35.8° during one of the no-pin tests.

A double lane change test was conducted on both 2013 and 2018 test vehicles at speeds over 72kph with two different simulations. The first simulation involved an intact lower spring link, and the second simulation involved a lower spring link with a cotter-pin removal after the initial steering input in Zone 1 and before entering cones in Zone 2. See *Figure 5*. Tests with observed vehicle sliding caused from understeering were mitigated by the vehicle's Vehicle Dynamic Control system (VDC). The VDC engagement assisted when delayed steering response was observed during Zone 2 and Zone 3 maneuvers. No rollover event occurred during testing. Results from these test simulations were deemed acceptable with no departure from cone set up and no indication that either vehicle is prone to a rollover event.

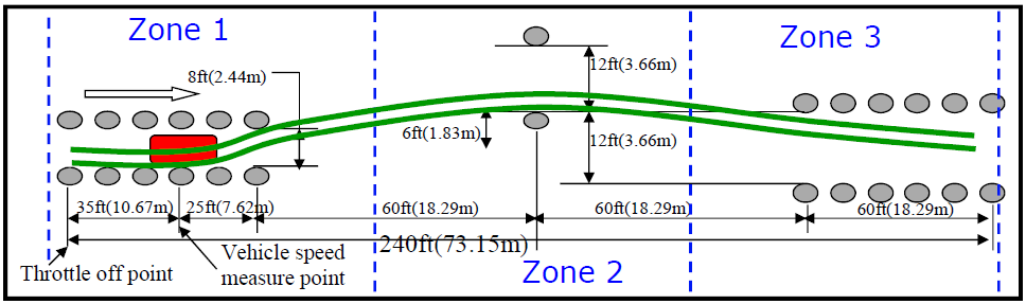

Figure 5. CU-Lane Split Test Course Simulation

The final test was conducted using criteria based on FMVSS 126, which is intended to ensure the vehicle's Electronic Stability Control System (ESC) intervention does not compromise the ability of the vehicle to respond to the driver's input. In these tests, the pin was removed during the initiation of first steering input. In all tests, both vehicles were able to meet the lateral stability criteria requirements of FMVSS 126 at 1.0 seconds and 1.75 seconds as shown on *Figure 6*.

L33 13MY

Run Date/Time	Mean entrance speed	First Peak Steering Wheel Angle (SWA)	Second Peak Steering Wheel Angle (SWA)	Yaw peak	Yaw rate at 1s	Yaw rate at 1.75s	Lat disp (from lat acc) at 1.07s		Yaw rate at 1s(°/s)		Yaw rate at 1.75s(°/s)	
	km/h	°	°	°/s	%	%	m	Pass/Fail	°/s	Pass/Fail	°/s	Pass/Fail
11/14/2019 12:59	81.555	-219.34	219.44	62.7529	-1.5551	7.079	-2.7548	PASS	-0.9759	PASS	4.4423	PASS
11/14/2019 13:02	81.871	-232.26	232.36	64.5406	-3.2631	6.9534	-2.7134	PASS	-2.106	PASS	4.4878	PASS
11/14/2019 13:06	81.498	-245.21	245.27	59.653	12.4519	8.0429	-2.8214	PASS	7.4279	PASS	4.7979	PASS
11/14/2019 13:09	81.516	-258.13	258.18	62.8148	0.8854	6.6702	-2.874	PASS	0.5561	PASS	4.1899	PASS
11/14/2019 13:12	81.463	-270.16	270.19	63.1609	3.6898	7.5501	-2.7801	PASS	2.3305	PASS	4.7687	PASS
11/14/2019 13:16	81.856	219.4	-219.38	-54.7764	7.562	-8.2714	2.8261	PASS	-4.1422	PASS	4.5308	PASS
11/14/2019 13:19	81.475	232.3	-232.32	-53.6708	-7.6749	-9.1081	2.8274	PASS	4.1192	PASS	4.8884	PASS
11/14/2019 13:22	81.409	245.23	-245.22	-55.4212	-11.5423	-8.3341	2.8475	PASS	6.3969	PASS	4.6189	PASS
11/14/2019 13:25	81.458	258.14	-258.16	-55.4617	-13.8255	-9.1351	2.8269	PASS	7.6679	PASS	5.0665	PASS
11/14/2019 13:32	81.434	270.13	-270.19	-56.7387	-1.7674	-7.8069	2.7974	PASS	1.0028	PASS	4.4295	PASS

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Run Date/Time	Mean entrance speed	First Peak Steering Wheel Angle (SWA)	Second Peak Steering Wheel Angle (SWA)	Yaw peak	Yaw rate at 1s	Yaw rate at 1.75s	Lat disp (from lat acc) at 1.07s		Yaw rate at 1s(°/s)		Yaw rate at 1.75s(°/s)	
	km/h	°	°	°/s	%	%	m	Pass/Fail	°/s	Pass/Fail	°/s	Pass/Fail
11/13/2019 12:33	81.497	-219.35	219.44	62.4685	-0.5606	5.2497	-2.9758	PASS	-0.3502	PASS	3.2794	PASS
11/13/2019 12:38	81.528	-232.26	232.34	67.3065	6.4303	5.234	-3.013	PASS	4.328	PASS	3.5229	PASS
11/13/2019 12:42	81.545	-245.14	245.31	60.4661	1.4328	5.7256	-3.1417	PASS	0.8664	PASS	3.4621	PASS
11/13/2019 12:48	81.435	-258.06	258.23	61.5772	3.5668	5.73	-3.1788	PASS	2.1963	PASS	3.5284	PASS
11/13/2019 12:52	81.477	-270.12	270.22	65.8426	-1.6483	4.7718	-3.2543	PASS	-1.0853	PASS	3.1419	PASS
11/13/2019 12:55	81.503	219.36	-219.41	-47.4721	-5.8521	-5.0706	2.7219	PASS	2.7781	PASS	2.4071	PASS
11/13/2019 13:01	81.497	232.3	-232.32	-49.7736	-3.9771	-3.7192	2.671	PASS	1.9795	PASS	1.8512	PASS
11/13/2019 13:07	81.464	245.21	-245.26	-50.2265	-5.0916	-5.1302	2.7698	PASS	2.5573	PASS	2.5767	PASS
11/13/2019 13:10	81.511	258.13	-258.18	-53.4088	-3.8318	-3.3775	2.7612	PASS	2.0465	PASS	1.8039	PASS
11/13/2019 13:13	81.428	270.13	-270.2	-51.9237	-3.02	-3.4248	2.8042	PASS	1.5681	PASS	1.7783	PASS

Figure 6. FMVSS-126 Test Criteria Results

FAILURE MECHANISM: A small crack may propagate along the weld bead between the rear lower spring link collar and rear lower spring link arm (*Figure 7*). Certain conditions, such as the amount of suspension strokes and extensive use of road salt for snow and ice control, may contribute to crack propagation. Subsequently, corrosion is introduced within the bushing located inside of the rear lower control arm spring link collar. This corrosion within the bushing increases the twist reaction force of the bushing, thereby increasing stress in the rear lower spring

link collar-to-arm weld joint (*Figure 8*). Over time, with enough corrosion and with the increased stress applied to the joint, the crack in the collar-to-arm weld joint may propagate. In some instances, the rear lower spring link collar may separate from the rear lower spring link arm, leaving three of four connection points for the multi-3-link rear suspension.

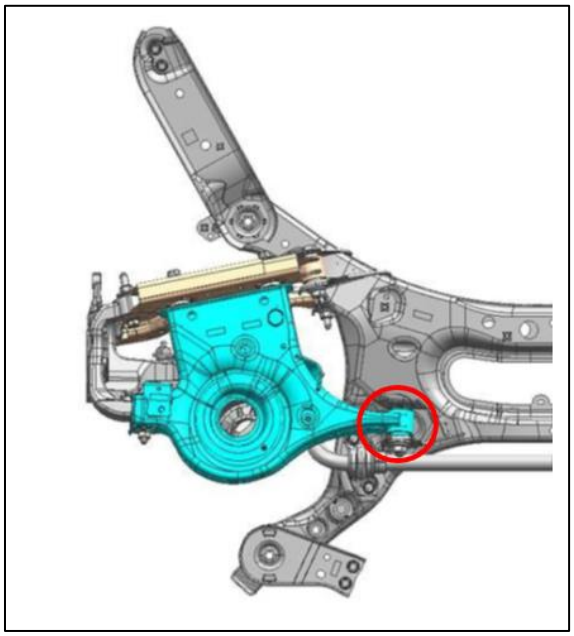

Figure 7. Point of Failure within Red Circle

Figure 8. Sample Part with Corrosion at Bushing and Bead Weld

NISSAN'S EVALUATION OF THE ALLEGED DEFECT: Nissan acknowledges that a crack may develop in the lower link of the control arm due to stress loading from normal use of the vehicle, and that road salts commonly used for snow and ice treatment results in corrosion that exacerbates growth and progression of the crack. Once a crack develops, continued use of the vehicle causes the control arm to separate at one of four attachment points that connect it to the vehicle chassis. In December 2017, Nissan completed a failure mode assessment involving multiple dynamic driving scenarios where a rear lower spring link was intentionally separated from the rear suspension member. Nissan maintained that due to the low incident rate, high detectability, and low risk of adverse vehicle dynamics, it did not believe this issue posed an unreasonable risk to motor vehicle safety.

ODI ANALYSIS: This investigation was opened based on 91 rear lower control arm failures. ODI was concerned that Nissan had not conducted rigorous and comprehensive testing to identify potential safety consequences of rear lower control arm failures. ODI reviewed 1,271 warranty claims, field reports, and consumer complaints received on a population of 2,043,354 vehicles with up to 11 years in service and averaging 113,000 miles at time of failure. This represents a 0.062% failure rate on the subject population.

The majority of failures have occurred in salt-belt states indicating that, along with the vehicle's time in service, exposure to environmental elements is a contributing factor to corrosion development. The magnitude of failures has varied, from some experiencing mild warning signs prior to failure and others experiencing a failure of the lower control arm's bushing. In most cases, consumers report continuing to drive the vehicle after becoming aware of a problem and are able to reach their destination or to a repair facility. ODI wanted to understand the consequence of the alleged failures and what risk it could pose to motor vehicle safety.

During the joint component testing, ODI was able to conduct rigorous driving scenarios and assess the potential safety consequence of the failure observed in the field. Both test subject vehicles demonstrated reasonable control during the simulated driving conditions conducted at NTCA. The vehicles did not experience a loss of steering ability when a failure was initiated with the pneumatic pin-pull. Nissan's willingness to conduct additional testing after their 2017 failure mode assessment demonstrates the steps they have taken to conduct a comprehensive review of the alleged failures. There is no evidence to suggest the adopted double weld bead

countermeasure is experiencing the same failure as the subject component, demonstrating its improved durability.

REASON FOR CLOSING: Nissan appears to have accurately identified the cause of the rear lower control arm spring link bushing corrosion in the subject vehicle population and implemented a production countermeasure to eliminate the condition. Nissan's ongoing service campaign P93240 and extended warranty cover all subject vehicles included in this investigation.

Through analysis of the information obtained to date, ODI has not identified sufficient evidence of a defect representing an unreasonable risk to motor vehicle safety as a result of corrosion in the subject rear lower control arm. Component failure detectability is evident prior to full separation. Nissan's VDC engages during events of lateral displacement and mitigates the yaw rate while allowing the driver to maintain vehicle control. With a declining trend of reports and Nissan's actions to implement a countermeasure and extended warranty coverage, further investigation of the issue does not appear to be warranted at this time. The closing of this investigation does not constitute a finding by NHTSA that no safety-related defect exists. The agency reserves the right to take further action if warranted by future circumstances.