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Subject: **Nissan Leaf 2013-2016 brake system failures**

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Executive Summary

The brake systems have failed in at least five 2013-2016 Nissan Leafs in New Zealand in recent months, and in one case a car had to veer off the road into a curb to avoid a collision with a truck. In these cases, it appears that the computer in the brake system, running the original 'Firmware A', effectively 'crashed'. Firmware updates for the brake control module exist overseas to resolve issues with the brake system, and it is possible these may resolve the issue that New Zealand Leafs are experiencing. New Zealand owners have not been alerted to the risk or the potential solution, nor how to react should the failure occur. The original firmware update ('Firmware B') to fix a problem that was attributed to cold weather was introduced overseas in October 2015, initially as a voluntary service campaign. In February 2016 it was escalated to a formal recall in Canada and the US, but remained a voluntary service campaign in the UK and Europe. It was never offered for vehicles sold in Japan even though they share the exact same faulty component as UK vehicles. More recently, some affected Leafs in Japan have received a later firmware upgrade ('Firmware C'), which is entirely undocumented in the public, but presumably supersedes the earlier 'B' variant.

We understand that there are currently approximately 2,400 registered 2013-2016 Nissan Leafs in New Zealand which are susceptible to this fault. More are being imported to New Zealand every month. We are also concerned that the need for the additional upgrade (Firmware C) indicates that the fix offered in USA and UK (Firmware B) may not solve the current problem, and there's some discussion around this in overseas online forums^{1 2}. According to Leaf-approved Nissan dealers in New Zealand, neither the original brake firmware upgrade (B), or the subsequent one (C), is currently available to them through Nissan NZ.

We urge Nissan and the New Zealand government to urgently evaluate, manage and publicly disclose the risks posed by this brake fault, and to provide an immediate remedy.

Details

The Nissan Leaf features an 'electrically-driven intelligent brake control module'. This is an electrically-assisted brake master cylinder rather than a vacuum-assisted brake master cylinder as found widely on a traditional car with an internal combustion engine.

The Leaf's brake master cylinder features its own integral control unit which interacts with other control units in the vehicle. It has the ability to command light braking requirements to be performed through regenerative braking using the traction motor only, or by a combination of this and the hydraulic brakes.

The firmware in the brake control module on MY2013-2016 Nissan Leafs built in all markets around the world contains a known fault. In rare cases, which according to Nissan is more likely with colder temperatures, this can lead to the brakes going into failure mode where the brakes are still operational, but require significantly more pedal effort and stroke to operate. Nissan has a firmware update which reportedly fixes this issue which they initially offered as a voluntary service campaign in both the US and UK. Later this escalated to a full recall in the US³. Service Campaign code P3527⁴ applies in the US, whereas P6306 applies for the UK and Europe.

The update was never offered for MY2013-2016 models built and sold in Japan despite clear evidence that these models are also affected i.e. within this model year range, Japanese models share identical brake hardware and firmware with other RHD models of the same year such as those sold in the UK. In MY2016 Leafs, the first few months of production had brake control modules also with firmware carrying an 'A' suffix. From February 2016 onwards, a revised 'C' version was introduced during production. However, no Japanese models produced

¹ https://www.carcomplaints.com/Nissan/Leaf/2015/brakes/service_brakes.shtml

² <https://www.speakev.com/threads/brake-failure.55561/>

³ <https://static.nhtsa.gov/odi/rcl/2016/RCMN-16V119-1600.pdf>

⁴ <https://static.nhtsa.gov/odi/rcl/2016/RCLRPT-16V119-8978.PDF>

before that date have ever been subject to any recall or voluntary service campaign to update them.

We are now aware of five cases in New Zealand of brake failure occurring on 2013-2016 Leafs (see Appendix for details). In all cases, the car was being driven at the time of failure. In one case, the driver narrowly avoided an accident by steering around a truck. In all of these cases, the driver had lost some confidence in their car after the event, and one owner chose to no longer own a Nissan vehicle. Considerable expense and disruption resulted, but thankfully, apparently no one has come to personal harm so far.

We have not been systematically collecting this information or actively asking our participating drivers (*Flip the Fleet*) or clients (*EVs Enhanced*), so there may well have been more instances of brake failure than we know of.

In all cases, the vehicles that experienced brake failure in New Zealand had the brake firmware version 'A' that is known to be faulty and recalled in USA and UK. Following inspection of three vehicles after the brake failure, we conclude that their brake control module became completely unresponsive. Instead of fault codes in the brake control module itself, there were historic fault codes in other modules as a result of them no longer being able to communicate with the the brake control module over the CAN bus at the time. In several of these cases, cold temperature was not a factor. In at least one case, the brake control module stayed unresponsive for several days and only started working again after the 12V battery was briefly disconnected and reconnected. This tends to indicate a firmware problem rather than a mechanical or electrical problem.

We have no way of knowing for sure if Nissan's existing firmware updates ('B', 'C', or both) for these control modules are indeed a reliable fix for this issue. The symptoms observed in New Zealand broadly fit the types of failures that have been described overseas. However, Nissan USA informed the National Highway Traffic Safety Administration (NHTSA) that the fault addressed by update 'B' was caused by colder temperature³. This is not a sufficient explanation for all the New Zealand observations. Nor is there any information that we can find in the public domain why a further Firmware upgrade ('C') has been fitted to some cars overseas already. Accordingly, we urgently request clarification whether the Firmware updates 'B' or 'C' are a sufficient fix.

Enquires with several EV-certified Nissan dealers in New Zealand have indicated that neither brake firmware upgrade (B), or the subsequent one (C), is available to them. Nor have the potentially affected drivers been warned of the risk, or instructed what to do should it happen. In some instances it may be possible to stop the car by exerting extreme brake pressure on the brake pedal or by engaging the handbrake (though the latter may in itself destabilise the car as it comes to a halt).

There are currently approximately 2,400 registered 2013-2016 Nissan Leafs in New Zealand which are susceptible to this fault, and hundreds in car yards. More 2013-2016 Nissan Leafs are being imported to New Zealand every month. We are also concerned that the need for the additional upgrade (Firmware C) may indicate that the fix using Firmware 'B' offered in USA and UK did not solve the original problem, and that tens of thousands of Leaf owners around the world are still at risk.

Nissan engineers and management will undoubtedly have more knowledge of this problem than we do and the New Zealand government may have accident records to assess the risk and a statutory responsibility to keep New Zealanders safe on the roads. It would greatly help formulation of our response to our clients and participating drivers to have both Nissan and official New Zealand government answers to the following questions:

1. Are you aware of other instances of brake failure in the 2013-2016 Leafs in New Zealand?
2. Do you agree that a significant risk exists and must be remedied as soon as practicable?
3. Do the symptoms we have described in five case studies so far match Nissan's understanding and remedies for brake failure in 2013-2016 Leafs overseas?
4. Does the firmware 'B' upgrade fix the brake failure problem entirely, or is the 'C' upgrade needed?
5. Are upgrades 'B' or 'C' currently available for affected 2013-2016 Nissan Leafs in New Zealand? If so, who through?
6. Will a firmware upgrade resolve this issue completely?
7. What should affected owners do now to remove the risk? Should they continue to use their car?
8. Who is responsible for installing and paying for the fix?
9. How will the risk be managed for affected vehicles already in New Zealand but not yet sold?
10. How will the risk from affected vehicles that have not yet been imported to New Zealand be managed?
11. More generally, how can NZ owners and dealers be alerted and protected from other faults that will arise from time to time in EVs that were imported?
12. How can *Flip the Fleet* and *EVs Enhanced* help communicate and manage the risk in the best ways to hasten the protection of the affected owners and public, while minimising the impact that this fault might have on EV uptake in New Zealand?

We have a duty to inform our participating drivers and clients of the risk they face, and consider that including answers to the above questions in our communications will aid in getting a full, detailed and factually correct message across. We will make a public statement about the issue and write to affected parties by Friday 2nd November 2018, at the latest.

We hope that, in the interim, Nissan and the relevant New Zealand government agencies will urgently take leadership of the issue by evaluating the risk, disclosing it to existing and prospective purchasers of 2013-2016 Leafs, and bringing forward a remedy.

Appendix: Technical data

Confirmed failure incidents

Case 1

Date: July 2018

Location: Cromwell

Driver: Henrik Moller

Car Chassis: AZE0-121295

Original FW#: 3NG9A

Details: During cold conditions (about 2 degrees C) and after a 30-minute stop drove off at modest speed (20-30 kph) and suffered what appeared to be a complete loss of brakes. To bring the car to a halt it was turned off. The car was scanned when back in Dunedin and it was found that the fault had caused the Brake Control Unit to become invisible on the CAN Bus (i.e., it was non-functional). Disconnecting and reconnecting the 12V battery several days later finally caused to Brake Control Unit to function again.

Case 2

Date: Mid 2018

Location: Dunedin

Driver: Anonymous

Car Chassis: AZE0-118xxx

Original FW#: 3NG9A

Details: Complete failure of braking system. Issues reported by dealer and firmware updated at request of dealer.

Case 3

Date: September 2017

Location: Auckland

Driver: Anonymous

Car Chassis: AZE0-1xxxxx

Original FW#: 3NG8A

Details: Complete failure of braking system. Car dealer took back the car as a result and traded it in for a Toyota. Issue reported by dealer.

Case 4

Date: October 2018

Location: Temuka

Driver: Anonymous

Car Chassis: AZE0-116xxx

Original FW#: 3NG9A

Details: Complete failure of braking system. Almost rear ended a truck, was able to steer off to side instead

Case 5

Date: October 2018

Location: Southland

Driver: [present in original memo but redacted in this document]

Car Chassis: AZE0-101939

Original FW#: 3NG5A

Details: Started car, no brakes reversing, no brakes going forward.

Diagnostics

In cars we could inspect post failure, the following historic fault codes were found:

ABS Module - U1000 & U110D (both indicating a fault with the ABS control module being unable to communicate with the brake control module)

VCM - U1000 & P3195 (both indicating a fault with the vehicle control module being unable to communicate with the brake control module)