

ZF Chronology

In November 2015, ZF became aware of complaints of noise in bus axles it supplied to Nova Bus for vehicles operated by the New York City Transit Authority. ZF began investigating the issue and informed the supplier of the brake calipers, Knorr-Bremse, of the complaints. Following inspection of the buses in New York, ZF made several unsuccessful attempts to diagnose and repair the source of the noise issue.

ZF continued to work with Knorr-Bremse to investigate root cause and corrective action throughout 2016. ZF investigated customer complaints and warranty returns and provided returned parts to Knorr-Bremse for analysis. ZF understands that, in November 2016 Knorr-Bremse identified improper surface roughness of the guide pin in its brake calipers as a sub-supplier manufacturing issue as the likely root cause of the issues observed in the field.

In January 2017, Knorr-Bremse addressed the manufacturing improvement of the guide pin surface finish issue in its assembly process. ZF and its service partners used Knorr-Bremse's repair kit to remedy affected vehicles in North America, in agreement with Knorr-Bremse.

In February 2017, there were additional noise complaints in New York. ZF and Knorr-Bremse inspected the buses, and parts were provided to Knorr-Bremse for further analysis. ZF and its service partners repaired affected brake calipers installed in the New York City Transit Authority fleet, in agreement with Knorr-Bremse.

In April 2017, ZF and Knorr-Bremse inspected buses in Cuba as a part of the ongoing investigation, and ZF repaired affected Knorr-Bremse brake calipers on affected vehicles.

In June 2017, Knorr-Bremse developed a service bulletin to address complaints of noise and uneven brake pad wear in the field. ZF provided the service bulletin to its customers in the U.S. and reported those communications to NHTSA pursuant to 49 CFR § 579.5.

In the months following the communication of the service bulletin, ZF repaired additional brake calipers in North America based on received complaints. In July 2017, ZF and Knorr-Bremse investigated complaints by inspecting buses operated by the Toronto Transit Commission, and ZF repaired affected vehicles in agreement with Knorr-Bremse. ZF continued its analysis of information received from the field, with Knorr-Bremse's assistance, through the rest of 2017.

In January 2018, ZF became aware of complaints from the Metropolitan Transit Authority in Houston. ZF and Knorr-Bremse inspected buses in Houston, and ZF repaired the brake calipers in buses in the fleet. ZF and Knorr-Bremse also gathered additional data and further analyzed vehicles in Houston as a part of the ongoing investigation.

In February and March 2018, ZF and Knorr-Bremse continued the investigation in Houston in order to better understand the brake caliper issue in buses in the field. During

that time, ZF and Knorr-Bremse began drafting a revised service bulletin to more specifically address ongoing issues in the field, based on information learned in the course of the investigation.

On April 12, 2018, ZF learned about in-service incidents purportedly involving brake calipers in buses in Brampton, Canada. From April 18-20, 2018, ZF and Knorr-Bremse inspected the buses and did further analysis. On April 19, 2018, ZF concluded that the Knorr-Bremse brake calipers incorporated into its axles contained a defect related to motor vehicle safety.