

Toyota's Sudden Acceleration Problem May Have Been Triggered By Tin Whiskers

Sharon Silke Carty | Jan 24, 2012 09:53 AM EST



[Comments \(927\)](#)

Even as Toyota has reckoned with a wrenching crisis of confidence, acknowledging reports that some of its best-selling vehicles have been prone to accelerating while drivers step on the brakes, the car giant has consistently maintained that its electronic systems are not the culprit for a series of lethal accidents.

Sometimes floor mats have been to blame, said Toyota, prompting recalls. Sometimes moisture has gotten inside gas pedals and caused them to stick, triggering another recall. And still other times drivers have hit the wrong pedal with their foot, the company has said. But when NASA conducted an investigation, it found no evidence of electronic malfunctions, according to the resulting report.

When that study was released last February, Toyota and the National Highway Traffic Safety Administration both seized on that conclusion as proof that Toyota's electronic systems were beyond reproach -- a contention amplified widely in media accounts. But buried within that same report are details that safety experts construe as disturbing evidence of problems potentially afflicting the electronic systems governing the gas pedal -- problems that Toyota and the highway safety agency have so far dismissed.

Investigators found so-called tin whiskers -- which grow on tin when it is electrified and can conduct electricity to unintended places -- inside the electronic systems in Toyota Camry gas pedals, according to the report. These wiry fibers of metal are thinner than a human hair and can sprout unpredictably. They have been implicated in crippling defects besetting a range of equipment, including communications satellites,

pacemakers, missiles and nuclear power plants.

The study falls well short of identifying tin whiskers as a cause in fatal accidents involving sudden acceleration in Toyota vehicles. But safety advocates say the mere confirmed presence of tin whiskers demands deeper investigation before such a causal link can be ruled out. Even sudden acceleration at slow speed can cause cars to run through stop signs, perhaps resulting in fatalities, they say.

"It's not potentially dangerous; it's absolutely dangerous," said Sean Kane, founder and president of Safety Research & Strategies, a Massachusetts-based auto safety consulting firm. "If you talk to anyone in the field, they'll tell you it's dangerous. NHTSA is trying to minimize what it means."

For Toyota, the world's second largest auto manufacturer, the existence of tin whiskers in one of its most popular models presents the latest in a string of troubling disclosures about the safety of its vehicles. The account of alleged acceleration problems linked to a highly publicized series of fatal accidents has shaken the company to its core, placing one of the business world's most admired brands under the harsh light of legal and regulatory scrutiny.

The company maintains that the issue of tin whiskers has already been fully examined, yielding no reason for additional concern.

"Our systems are designed to reduce the risk of tin whiskers in the first place," said Toyota spokesman John Hanson. "And we have many fail-safe systems in place to counter any short circuits that might happen."

A spokeswoman for the NHTSA concurred that tin whiskers do not pose an area of concern, reiterating that agency's position that the NASA report eliminates such worries.

"NHTSA is monitoring the issue, but there is currently no indication of a safety concern that would warrant further action," said the spokeswoman, Lynda Tran.

The debate over tin whiskers, largely out of the public eye -- among scientists and car safety advocates -- is the latest thread of concern stemming from the high-profile safety concerns that began dogging Toyota vehicles three years ago. In late 2009, Toyota issued a recall citing evidence that floor mats in some models were apparently getting stuck under the gas pedal, causing acceleration. In early 2010, Toyota issued a second recall, saying some gas pedals could stick, continuing to add gas to the engine even after a driver took a foot off the pedal.

In a February 2011 report that accompanied the NASA study, NHTSA identified a third cause: Drivers sometimes press on the gas when they mean to step on the brake.

But outside safety experts have long speculated that a fourth cause could be at play in cases of unintended acceleration: faulty electronics. In March 2010, the highway safety

agency asked NASA to investigate, prompting the investigation whose results the agency published last February.

Tin whiskers are discussed on pages 17, 112 to 117 and 171 of the resulting 177-page report. NHTSA, which is responsible for overseeing driver safety and pushing automakers to conduct recalls in response to problems, says the study determined that the tin whisker effect in Camry sedans is minimal and not dangerous.

The problem can cause engine revving, surging and hesitation. But all those issues are eliminated as soon as a driver take the foot off the gas, NHTSA asserted on the basis of an analysis of NASA's data, consumer complaints and Toyota's warranty data. The agency concluded that it was effectively impossible for tin whiskers to have caused Toyota vehicles to have accelerated out of control.

"Neither NASA nor NHTSA has any evidence indicating that tin whiskers have caused high-speed, unintended acceleration or are capable of doing so," Tran said.

But the details of the report reveal that NASA and NHTSA based their conclusions on a tiny sample of evidence. The analysis looked at just three gas pedals. Two of the pedals came from drivers who complained their cars lunged forward when they pressed on the gas pedal. The third came from a car in a junkyard. Despite the fact that all three pedals were passed around -- one was shipped via FedEx across country, and no one knows how the car in the junkyard was handled -- the fragile, thin tin whiskers stayed intact. NASA found tin whiskers in all three pedals.

None of the inspected pedals were from cars that experienced high-speed unintended acceleration, the circumstance of greatest concern. NHTSA brushed off suggestions from safety and electronics experts that it needed to examine those sorts of gas pedals, asserting that it had already conclusively determined that tin whiskers could not cause high-speed sudden acceleration. Furthermore, NHTSA said, the tin whisker problem is rare, affecting a small number of 2002 to 2006 Toyota cars.

Toyota also dismissed suggestions from outside critics that tin whiskers could pose a problem. The issue happens infrequently, Toyota said, and when it happens, cars automatically react and go into what's called "limp home mode." That limits how fast the car can go, and drivers are forced to consult a mechanic to figure out what's wrong.

But researchers at the University of Maryland's Center for Advanced Life Cycle Engineering published a paper last fall saying they found evidence of more tin whiskers in Toyota gas pedals. They examined pedals from two Toyotas -- a 2005 Toyota Camry and a 2002 Camry -- probing them with X-ray fluoroscopes and scanning electron microscopes to look at the inner workings. They found six tin whiskers growing inside one of the pedals and two inside the other. Based on how many tin whiskers they discovered and how many NASA found, they estimated that the whiskers could cause shorting failures in 140 out of 1 million vehicles, which could result in more sudden acceleration cases.

Given that Toyota sold 3.3 million cars in the past two years alone, such a rate would amount to a significant problem.

Some experts at NASA -- the agency NHTSA relies on as basis for its contentions -- have offered a more complex depiction of the potential problems of tin whiskers, one that appears to undermine the central notion that the fibers of metal are not a problem.

Last fall, Henning Leidecker, an expert for NASA's Goddard Space Flight Center in Maryland, gave [a presentation](#) that lent credence to the idea that tin whiskers could render any car with this problem effectively inoperable.

Leidecker used X-rays and microscopes to examine a gas pedal from Albuquerque that was malfunctioning. He found two tin whiskers inside. One whisker was long enough to bridge the internal electronics and was causing a short. Leidecker discovered that the specific gas pedal would work fine if depressed quickly. But when pushed slowly, the accelerator jumped and sped up suddenly. If pressed even harder, the throttle sometimes opened entirely, as if the driver were pressing intending to speed up rapidly.

"Although the vehicle would operate, we did not consider it to be drivable," he wrote in the presentation.

Leidecker told The Huffington Post he was willing to discuss his presentation but asked that an interview request be cleared by NASA's public affairs department, which subsequently referred questions back to the Department of Transportation, the overseer of NHTSA. A NHTSA spokeswoman reiterated the agency's position that the NASA report backed up claims that Toyota's electronic systems have not caused incidence of sudden acceleration.

THE CASE IN ALBUQUERQUE

A driver from Albuquerque, N.M., was one of the first people to catch NHTSA's attention with an acceleration problem. She filed a complaint through NHTSA's Office of Defect Investigations, stating that her 2003 Toyota Camry would hesitate when she pressed on the gas and then would surge forward.

Although her name was stricken from the resulting NHTSA complaint, the details of the incident are not. The NASA report cites the substance of her complaint.

According to the report, the driver complained that in November 2009 the accelerator on her 2003 Toyota Camry began performing erratically.

"When stepping on the gas pedal, I couldn't get any gas, and the car would jerk forward at a rapid rate so that I had to apply the brakes," she told NHTSA. "It was totally undrivable."

After several months, the agency reached out to the woman and spoke to her by phone in conversations that are not included in NHTSA's public record. Emails in NHTSA's database show that the agency asked her to ship her gas pedal to investigators in Washington. The agency then forwarded the pedal to NASA. The tiny, brittle tin whiskers inside the part stayed intact despite the fact they were shipped across country. Investigators found two tin whiskers – one 1.9 millimeters in length and one 1.5 millimeters long and about 1/10th to 1/100th the width of a human hair.

One of the whiskers was causing part of the accelerator to short out, according to the report.

The agency also examined other accelerator pedals, including the one from the junkyard. Those, too, contained tin whiskers in similar locations, according to the report, though they had yet to cause problems in the functionality of the pedals.

NHTSA and Toyota say there is no evidence the tin whiskers cause cars to accelerate out of control. The Albuquerque driver was still able to brake, they argue, and when she lifted her foot off the gas, the engine stopped revving.

Toyota said the fail-safe modes kick in when there is a short, forcing the car into "limp home mode," which tops out the speed at 35 mph to 45 mph.

"It induces deceleration, so it's almost the opposite effect" of sudden acceleration, he said.

But the Albuquerque driver told NHTSA that her vehicle had, on the contrary, jerked forward rapidly when she pressed on the gas. Hanson said he wasn't sure if Toyota had examined her gas pedal.

The release of the NASA report last year prompted a letter to NHTSA from Gordon Davy, a retired materials engineer from Northrup Grumman who had previously inspected failed relay switch boxes from E3 radar planes and discovered they were covered in tin whiskers. He urged NHTSA to reconsider its reassurances about the sanctity of Toyota's electronic systems, arguing that the agency's findings were not supported by the available facts: The mere presence of tin whiskers makes accidents a real threat, even as accidents are rare.

"Dismissing the lessons learned from decades of study of tin whiskers and the failures and countermeasures employed by other industries in the case of motor vehicle unintended acceleration is too dangerous," he wrote, adding, "Lives are at stake."

SHARE THIS STORY