

An Engineer's Eureka Moment With a G.M. Flaw

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By [BILL VLASIC](#) MARCH 28, 2014

DETROIT — Somewhere inside the two-inch ignition switch from the 2005 Chevrolet Cobalt was the clue that Mark Hood was seeking.

Mr. Hood, an engineer in Florida, had photographed, X-rayed and disassembled the device in the fall of 2012, focusing on the tiny plastic and metal switch that controlled the ignition. But even after hours of testing, Mr. Hood was at a loss to explain why the engine in Brooke Melton's Cobalt had suddenly shut off, causing her fatal accident in 2010 in Georgia.

It was no small matter to her family, which had hired Mr. Hood for their lawsuit against General Motors.

Then he bought a replacement for \$30 from a local G.M. dealership, and the mystery quickly unraveled. For the first time, someone outside G.M., even by the company's own account, had figured out a problem that it had known about for a decade, and is now linked to 13 deaths.

The discovery was at once subtle and significant: Even though the new switch had the same identification number — 10392423 — Mr. Hood found big differences. A tiny metal plunger in the switch was longer in the replacement part. And the switch's spring was more compressed. And most important, the force needed to turn the ignition on and off was greater.

“There was a substantial increase in the torque of the switch,” Mr. Hood said. “We took measurements. And they were very different.”

So began the discovery that would set in motion G.M.'s worldwide recall of 2.6 million Cobalts and other cars, and one of the gravest safety crises in the company's history.

Mr. Hood came to realize that G.M., and the supplier that made the part, Delphi, had quietly changed the switch sometime in 2006 or early 2007, making it less likely that an unsuspecting driver could bump the ignition key and cause the car to cut off engine power and deactivate its air bags. The change was made so quietly that G.M. hired outside consultants last year to help identify which Cobalt model years contained the original switch.

Now, the details behind the change have become critical issues in determining whether the automaker intentionally concealed a safety defect. Next week, G.M.'s chief executive, Mary T. Barra, and the nation's top auto safety regulator, David Friedman, will testify before the House and Senate about events leading up to the wide-ranging recall.

Mr. Hood's work in the Melton case was a turning point in solving the mystery of the faulty switches, and led to the first depositions by G.M. engineers that confirmed years of internal studies of ignition problems in the Cobalt. G.M. settled the wrongful-death suit brought by the Melton family last year.

"It was obvious they changed the switch, and we showed G.M. that," said Lance Cooper, the Georgia lawyer who represented the Melton family.

It was hardly a straight path to Mr. Hood's finding. After taking the case in 2011, Mr. Cooper first hired a mechanic to see if the crash was related to a power steering problem that was the subject of a G.M. recall at the time.

But data taken from the car's black box pointed to ignition failure — and Mr. Hood, a veteran investigator of the engineering of airplanes, cars, trains and medical devices, was given the task of analyzing it.

Mr. Hood zeroed in on how the switch functioned. He learned that the small plastic-and-metal component at one end controlled whether the car's engine was in the on, off, or accessory position. The accessory position allows certain electronics, like the radio, to run.

Once he determined that the original part from Ms. Melton's car differed from the store-bought replacement, Mr. Hood began combing junkyards, acquiring more switches from Cobalts — 18 in all.

By the time Mr. Cooper started taking depositions from G.M. engineers in April 2013, Mr. Hood had documented the change in the part so thoroughly that the company could not escape the facts.

In one deposition, Mr. Cooper confronted Raymond DeGiorgio, the head switch engineer on the Cobalt, with the differences between the original switch and the replacement. While Mr. DeGiorgio said he saw the differences, he could not explain why the part had been changed without a corresponding change in its identification number.

"I was not aware of a detent plunger switch change," he said. "We certainly did not approve a detent plunger switch change."

But in federal filings for the recall in February, G.M. said that an unnamed engineer had in fact signed a document in April 2006 approving design changes in the switch suggested by Delphi.

In the same filing, the automaker also acknowledged that Mr. Hood's detective work on the switch changes was the first time an outsider had "observed and documented" the switch change.

Government investigators have requested that G.M. provide any documents chronicling the switch change and who within the company approved it.

The change of a basic part on a high-volume vehicle like the Cobalt is unusual, and correspondence between G.M. and Delphi on the switch could be seen as evidence that the automaker knew the original part was defective.

It was not just the Cobalt that contained the switch. In addition to the 2005-7 Cobalt, G.M. also recalled the 2007 [Pontiac G5](#), the 2003-7 Saturn Ion; the 2006-7 [Chevrolet HHR](#) and [Pontiac Solstice](#); and the 2007 [Saturn Sky](#). On Friday, G.M. added 971,000 later model Cobalts and other cars to the recall. Late Friday, G.M. raised the number of deaths linked to the faulty switches from 12 to 13, after confirming an additional fatality related to an ignition-switch accident in Canada.

Mr. Hood's research could also play a part in class-action suits filed against G.M. covering all owners of Cobalts and other vehicles in the recall.

He said his investigation was nothing extraordinary in scope, just a meticulous breakdown of a commodity auto part found in millions of vehicles.

The newer, improved switch has now gone back into production at a Delphi plant in Mexico. Ms. Barra said two shifts of workers were making the switch, with a goal of having initial shipments ready for dealers by early April.

G.M. has said it will replace the old switch with the new one, at no charge to vehicle owners. In the interim, Ms. Barra told customers in a video on a company website that the recalled cars were [safe to drive](#), as long as there were no objects attached to the ignition key.

The moment that will linger for Mr. Hood is when he removed the switch from the ignition assembly salvaged from Ms. Melton's car. He then replaced it with the store-bought part, and realized how much better the entire part worked.

"It's satisfying to me because I'm working on behalf of the Meltons," he said. "It won't bring their daughter back, but if it goes toward a better understanding of the problem, it might save someone else."