Who is Dr. Belt?

Dr. Ronald A. Belt is a retired electronics engineer in Minneapolis, Minnesota. He received a Ph.D. in physics in 1970 and was awarded a one year post-doctoral fellowship in solid state physics by the National Research Council. He has over 40 years of experience in electronics, with ten years as a civilian research scientist at the Air Force Avionics Laboratory at WPAFB, OH, fifteen years as a research scientist at Honeywell's Systems and Research Center in Minneapolis, MN, and fifteen years as an engineer at Honeywell's Military Avionics Division in Minneapolis, MN. In 2007 he received Honeywell's highest engineering award for improving the electronics associated with Honeywell's newest MEMS gyro. He retired in 2011, and began working on sudden acceleration because it was more interesting than working daily crossword puzzles, and because he could apply his prior electronics experience with the possibility of achieving a useful result for his efforts. He has written eleven papers to date on sudden acceleration, and has participated in meetings with NHTSA's NASA team and with NRC's study team back in 2010. His first two papers proposed latch-up as a cause of sudden acceleration, but were later found to be incorrect because Toyota had already anticipated the problem he proposed and had eliminated it by using more advanced technology known as silicon-on-insulator technology. He learned from these first two papers that a better understanding of the problem was needed, so his next nine papers (which can be found at http://www.autosafety.org/dr-ronald-belt%E2%80%99s-sudden-acceleration-papers) were based more solidly on direct observations of sudden acceleration incidents as reported by multiple drivers. Dr. Belt has no involvement or financial interest in the automotive industry, no involvement or financial interest in automobile-related litigation as an expert witness, and no financial interest in consumer advocacy or writing about consumer affairs. He has no axe to grind with any automotive company, and has owned three Toyota vehicles, which he considers to have been excellent vehicles that exceeded his expectations for high quality. His sole interest is to be objective in finding the root cause of sudden acceleration.

Question: Dr. Belt, if your first two papers were wrong about the cause of sudden acceleration, is it possible that your later nine papers are also wrong about the cause of sudden acceleration?
Answer: Yes, it is possible that my later nine papers are also wrong because the theory has not been tested at this time. However, it is difficult to come up with any plausible theory of sudden acceleration, so when is one is able to come up with a theory that explains so many of the observations associated with sudden acceleration as this one does while causing no diagnostic codes to be registered, one feels that the theory must be largely correct. There may be slight changes needed in how the negative voltage spike produces an incorrect voltage compensation value, like maybe the voltage spike causes a memory upset instead of just being sampled incorrectly, or maybe there are two compensation values instead of only one. But overall, I believe that the theory is better than 90% accurate. I have been unable to test the theory myself because of the expense involved with getting a suitable vehicle and with getting the test equipment needed. But I have provided detailed instructions to NHTSA and others for testing the theory in the most expeditious manner possible. I hope that someone is able to do this as soon as possible.

Question: NASA claims that they tested Toyota vehicles for negative voltage spikes on the voltage supply line. Why didn't NASA find any electronic cause of sudden acceleration during this testing?
Answer: NASA tested only two Toyota vehicles for low voltage spikes on the voltage supply line. These vehicles may have been tested while the transmission was in PARK, which does not conform to drivers' observations that sudden acceleration never originates in PARK, but only originates while in DRIVE or REVERSE, or as the vehicle is being shifted into DRIVE or REVERSE. Also, my theory states that the negative voltage spike must occur while the vehicle's supply voltage is being sampled by the CPU. It is likely that during NASA's testing the negative voltage spikes they applied to the supply line did not occur while the supply line was being sampled by the CPU. This can be verified by applying a negative voltage spike to the supply line and using a scan tool to look at the SRAM memory in the ECM to see if the voltage sampled by the CPU is lower than the DC value of the supply line.

Question: Do you think that tin whiskers might also be a cause of sudden acceleration?

Answer: I believe that tin whiskers might be responsible for a small number of sudden acceleration incidents, but that the majority of sudden acceleration incidents are caused by negative voltage spikes affecting the throttle motor voltage compensation coefficient. For tin whiskers to cause sudden acceleration, one must have two electronic faults: 1) one fault to short the two APP sensor outputs together with just the right resistance to defeat the diagnostic test software, and 2) one fault to raise the two APP sensor outputs toward +5V with just the right resistance to cause an acceleration. These two faults can be caused by two tin whiskers, or by one tin whisker and another type of fault, such as a fretted connector or a partially broken wire. While such multiple faults are possible on occasion, for such multiple faults to occur in the vehicles of so many different automobile manufacturers using different components and different manufacturing processes, seems to me to be too low a probability to cause the total number of sudden acceleration incidents observed. Also, to explain the loss of braking ability during sudden acceleration, one needs to have additional tin whiskers or associated faults. Finally, to explain how an engine resumes normal operation after a sudden acceleration incident only to have another sudden acceleration incident occur a few days or a few weeks later, requires even more tin whiskers, or a mechanism for their rapid regrowth. This all seems too complicated to explain how sudden acceleration may occur in many vehicles made by many different manufacturers.

Question: Do you think that Toyota knew the cause of sudden acceleration in its automobiles?
Answer: I believe that, aside from a few cases, Toyota did not know the cause of sudden acceleration in its automobiles, and still may not know the cause of sudden acceleration in its automobiles. I believe that if they had known the cause of sudden acceleration, they would have fixed it over the years. I believe that when sudden acceleration first appeared, Toyota believed it was not their problem, and did not investigate it thoroughly thinking that it was caused by the drivers themselves. As more cases continued to appear, Toyota began looking for a cause, but only superficially by mining the official field reports submitted by their dealers. This caused them to focus on problems that the dealers themselves could diagnose and fix, such as floor mats and sticky pedals. Toyota did manage to buy back some vehicles involved in sudden acceleration incidents so they could conduct further tests, but their search may have been hampered by the inability to reproduce the problem. Also, they may have limited their search to looking for fault modes with which they were already familiar, which proved fruitless for finding the actual cause. Finally, the actual cause of sudden acceleration, namely negative voltage spikes affecting a learned software value, appears to fall in a responsibility and knowledge crack between Toyota and its electronics supplier, Denso. Therefore, there may have been few people in either organization who could ask the proper questions to find the true root cause. This view of Toyota's experience seems to have been repeated at every other automobile manufacturer. It seems that the entire industry is unprepared to accept the environmental consequences of putting more and more electronic control functions into its vehicles. And this problem continues to grow worse every year, as we see with the introduction of electronic power steering, adaptive cruise control, and brake by wire.

Question: Do you think that brake throttle override as recently mandated by NHTSA will stop sudden acceleration?
Answer: I believe that the effectiveness of brake throttle override for stopping sudden acceleration depends upon how it is implemented. For example, some vehicles with brake throttle override already exist on the market prior to NHTSA's regulation, yet have been involved in sudden acceleration incidents. This is understandable, because it isn't possible to eliminate something when you don't know what is causing it. For example, if you believe that sudden acceleration is caused by the driver stepping on the accelerator pedal simultaneously to stepping on the brake pedal, then you can design the system to disregard the accelerator pedal input and cause the vehicle to slow down. However, if sudden acceleration is actually caused by the throttle control loop going unstable and making the throttle motor go to wide open throttle, then disregarding the accelerator pedal input may not help at all. I believe that once the cause of sudden acceleration is understood (hopefully as a result of the mechanism I have proposed), then it will be possible to design a brake throttle override system in an effective manner. Until then, merely mandating the existence of a brake throttle override function, without explaining how to design it and/or how to test it (as NHTSA has done), is misleading to the public because there is no way to verify that it is effective in stopping sudden acceleration.