This sensor – an accelerometer that’s only a few millimetres across – will deliver vital impact information to help researchers understand driver injuries during a crash.

This tiny chip – the result of a collaboration between the FIA Institute and one of the world’s biggest semiconductor companies – is set to revolutionise safety in Formula One.
tiny chip is about to make a huge impact on motor sport safety. Just 3mm wide, it may be smaller than a matchstick head but within that space sits some serious engineering that could ultimately save lives.

It's an accelerometer of the type you might find in any smartphone or other mobile device that senses movement or acceleration. But this one has been specifically designed for use in sport. Working in conjunction with STMicroelectronics – a $9 billion turnover company that makes components for many consumer devices – the FIA Institute has adapted the sensor for use by racing drivers. The sensor will be implanted in the driver's earpiece and inserted directly into his ear canal. It measures acceleration across three axes and continuously captures data about the forces acting on a driver's head, which is especially important in an accident. The data is delivered in real time and provides vital information for trackside doctors as well as safety researchers looking to make improvements.

FIA Institute research consultant Andy Mellor, who is leading this project, believes it could lead to a major breakthrough in safety research. "There's so much we can learn from a crash if we have the right information," he says. "For the last few years we've relied on Accident Data Recorders and these have given us hugely important information after a crash. However, they only tell you about the forces acting on the car. So the possibility of tracking the motion of the driver themselves is a major breakthrough. The information from the accelerometer could give a precise kinematic of the head and the timing of the head movement during an accident."

Currently the only way for safety researchers to study the forces on a driver's head is to conduct a full-scale sled reconstruction in a test lab. The results are effective but take a long time and are extremely expensive. This tiny sensor will hugely speed up that process.

Mellor says: "In high-g impact accidents, such as the one suffered by Sergio Perez at the 2011 Monaco GP, you could have the information immediately. Doctors could use it to potentially assess what course of intervention they might need to take. Safety researchers could know straight away whether more work should be done on things like head rests or seat positions. It will add to our knowledge base."

This new information could have a major influence at the top level of motor sport, from car design to equipment manufacture.

Mellor adds: "Just having that knowledge will take us into a world we haven't really been in before. Ultimately it will be helping us to design better cars, to make better safety equipment such as harnesses and helmets, to improve the positioning of the driver within the car with better seats, surrounds and side support."

The idea for the project was presented by Mellor first became involved in the project in 2004 when the Indy Racing League was using a larger accelerometer fitted on the outside of the driver's ear-piece. The FIA Institute did a detailed study back then and found that although the results could be useful, there was a significant decoupling between the head movement and data from the device. Mellor's endeavour was to find a device so small that it could go deeper into the ear canal to ensure more accurate results. After a couple of false starts, he was introduced to STMicroelectronics by a colleague two years ago and that's when the project gained pace.

The chip is so small that it will become an integral part of a driver's earpiece. So much so that Sebastian Vettel (left) won't even notice that he is carrying a potentially life-saving extra piece of equipment.

Mellor says: "ST was right on the ball with the tech we needed, even though they didn't make the part we wanted at the time. From the moment we sat down with them it was obvious they had exactly the technology platform we needed." The resulting sensor is based on a platform part that ST mass-produces for smartphones. It is, in fact, this tiny chip is about to make a huge impact on