

TESTING TIMES



Motorsport is dangerous but Radical is constantly striving to make it safer. Michael Wood spent a day witnessing an SR8 chassis being FIA crash tested.

Photography: Andrew Szymon

From an early age I have witnessed numerous different cars battle at Brands Hatch, more often than not at the bottom of Paddock Hill Bend. Here you could almost guarantee an accident unfolding, whether in the middle of the corner or washing wide and impacting the tyre wall with a sickening thud. Although many would safely come to a halt in the gravel trap, the odd exception would end up buried in the tyre with the St. Johns Ambulance crew in hot pursuit. With the driver evicted it was then the job of the recovery vehicles to pull the mangled wrecks out of the wall and

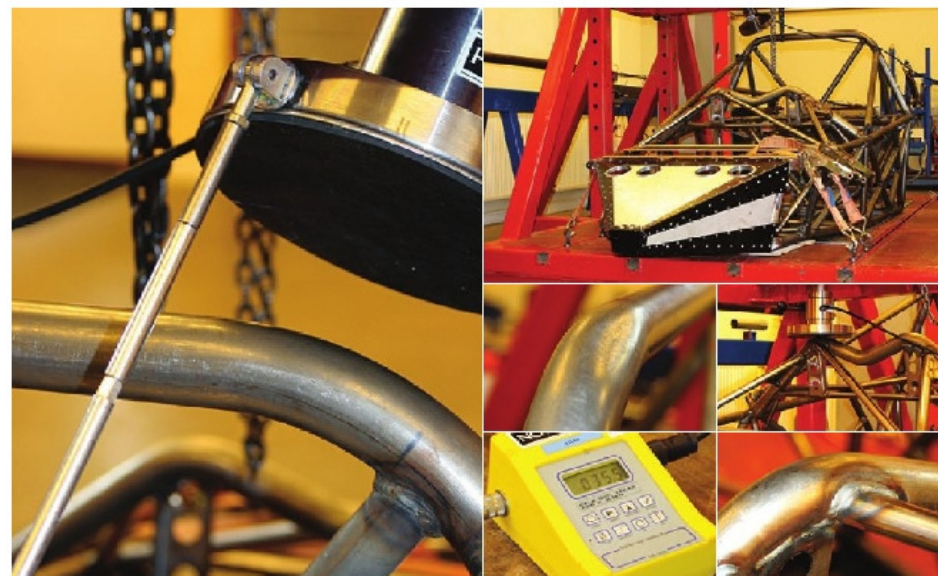
reveal squashed body panels and a bent chassis. Emocently looking on I just hoped the driver was ok.

Although the incidents requiring the help of the St Johns Ambulance were not a too common occurrence at Brands, when they called for it, and everybody around me, clearly knew it was serious. We are constantly reminded that motorsport is dangerous but only when a driver is ejected off in an ambulance with the sirens blaring do you fully appreciate the real danger this is. In the UK there are 34,000 licence holders, some professional but the majority are not. Most are people with full time jobs, and motor racing is simply their hobby.

Shows: Strapping down the SR8 chassis shortly before having its nose cone fitted and followed by driving head first into a wall at Cranfield University

With the amount of people competing each weekend race car manufacturers have a big responsibility to the people that drive them.

Radical Sportscars is one of the manufacturers taking their responsibility seriously and the clever guys from the R&D department invited us along to watch them complete a full FIA crash test at Cranfield Impact Centre. With those images of the high impact crashes from Brands scarred in my head I duly accepted and headed to Cranfield University. Holyoke is a race track, but driving through the maze of buildings - that confine the university - we're eventually confronted with airplanes



Land a sixfield... this is not the normal run-of-the-mill university. Engineering, manufacturing and aerospace are some of the main subjects on offer.

Entering Cranfield Impact Centre, we're greeted by a huge metal frame, which is the crash test rig, with the bare space-frame chassis of the Radical SR8 strapped under it. The idea of the day is to recreate the type of pressure on the chassis that would occur when in a crash. Both the front and rear roll-over structures, the sides of the chassis, the

roll-bar; and at an angle into it. Someone in a white coat then calculates the angle and pressure that needs to be applied to that area of the car that would replicate all of these kind of forces. A calculation I'm glad I didn't have to figure... but the amount of pressure put onto the roll bar worked out to be six tonnes.

I imagined - before I went in - that the end result would be a crumpled chassis, a bunch of bent tube and a frame which no longer resembled a car but I could not have been more wrong. With six

With six tonnes of pressure I expected to see the roll-bar completely fold up! So you can appreciate my surprise - when the pressure was gradually pumped into the roll-bar - when it didn't collapse in a heap

tonnes of pressure I expected to see the roll-bar completely fold up! So you can appreciate my surprise - when the pressure was gradually pumped into the roll-bar - when it didn't collapse into a heap on the floor. In fact I wasn't sure if the test had actually started! It slightly dented the tube but by so little that you wouldn't notice it unless someone had physically pointed it out. So this clearly passed the first part of the test.

Next was the front roll structure, just in front of the steering wheel. Out of all the procedures from the day, this was the one that worried engineer, Nick Walford, the most. If this part fails the test (or any

Shows: The roll-over bar was the first section to be tested at loads measuring over six tonnes... it passed. A similar test on the front bars, forward and allows the steering wheel, also resulted in a pass with the Cranfield test specialist calling it 'over-engineered' for the job. In other words very good

other part for that matter) then Radical would have to go back to the drawing board as well as booking at other crash test a further two weeks on. More time and money. Reassuringly for Nick less pressure was to be applied, just three and a half tonnes this time. Straight down on top of the structure where the pressure was to be applied and the worry was all for nothing, which was reflected by the glowing results. So much so that the Cranfield boss described it as being 'over-engineered' - praise indeed. To the naked eye there was even less impact than to the rear roll bar and I personally couldn't even see so much as a smudge, although I was reliably informed there was the 'mist of incidents'.

This all sounds rather exciting, like watching those old crash test movies from sixties no doubt (tiny.cc/m98c83) but the reality was that the majority of the day is taken up with setting up each test. Moving the 700kg chassis (weighted to 700 kgs in total, to replicate car with driver) from one place to another, bolting it down securely, takes a team of four. Even though every one of them had their designated roles, the setup is carried out surprisingly quietly - bearing in mind the precise nature the FIA demands.

To demonstrate this the next test on



CRASH TESTING



the list would measure the strength of the chassis during a side impact. This required us to move into a bigger facility. An indoor crane swept overhead to pick up the chassis and put it onto another 'slab of metal'. The Cranfield team then worked around the chassis to secure the car in position ready for the tests. On this occasion three separate loads are put on the side of the chassis with two tonnes of pressure. This is done for three minutes, after which to pass the FIA regulations no more than 1mm of deformation is allowed. Measured by a similar device used to monitor suspension travel for F1 logging software it's highly accurate and unsurprisingly the car passed with flying colours. Out of all the tests, this was far more interesting to watch. As the pressure was applied you could see how other parts of the frame adjusted and moved to allow the side impact to stay within the limit. Still without any major noticeable change to the chassis.

As the timed ticked on, some of the Cranfield team started to prepare the steering column crash test. This test was to be much more of a spectacle for us to watch. The steering wheel, steering column and steering rack assembly are tested with an impact straight into the steering wheel, to represent a driver being flung forwards. Although this test

is done vertically rather than horizontally like in a car, gravity provides the force of something being slammed into the wheel, in effect providing the exact same situation just from above. A 8kg mass is dropped onto the steering assembly travelling at 2m/s (metres per second) and it must not exceed 80% of force for 3ms (milliseconds). Again an FIA boffin has figured out the amount of g's a driver can handle in an impact without causing brain damage. It passed with a nice margin, but to pass the FIA test the steering wheel needs to be able to be removed after the impact... which it does.

There seemed to be little doubt that this was going to pass on its first attempt. Radical have been back and forth prior to this final FIA test with a prototype space frame chassis (exactly the same and very expensive process they undertook for their SR9, TAMP1 and LM12 carbon fibre chassis), and after numerous minor alterations to those 'first test' is for the actual production SR8, SR3 and SR5 chassis'. So from Radical's immense crash test experience the guys have now built this SR8 to pass each test with reasonable ease. These are a far cry away from 'marginal' passes.

One of Radical's main developments is the aluminium honeycomb front nose. This is one of the vital parts of any race

Above: Michael judges the Cranfield tests with some measurements after the steering column received a beating. Loads push onto the chassis from all angles yet the SR8 chassis passed with flying colours.

car and although head-on crashes are rare, buried cars in tyre walls most first aren't. And it's what's behind the tyre wall which more often than not cause more damage. As drivers our legs are already in a vulnerable position, so a head-on crash could crumple and push frame and body work into your legs, body or helmet. This could be fatal or cause very serious injuries and often does... both. The front crash structure absorbs the impact, taking away the strain which would normally go through the frame, stopping any of chassis bending and protruding inside the cockpit, where it could cause further harm to the driver.

So now it was time for the front nose to be put to the test. This is what most of us have seen pictures or videos of, a stereotypical F1 nose being smashed into a wall and crushing to very little; it's a sled test. The Radical chassis is mounted on to the sled with an extra 75kg to represent the weight of the driver in the car. The sled will then travel towards a solid wall at 12m/s which is around 30mph. Although it does not sound a lot, the sled is about to smash into a solid wall that does not give any notice at a race track when gravel trap, tyre wall and any other absorbing materials all contribute to the deceleration of the car before and during an impact. High speed

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cameras are setup for all manufacturers that come and they can see the impact in super-slow motion! A great way to see what went wrong or right, how the structure collapsed during the impact. With the Radical attached and our GoPro Cameras also applied to the rig and wall, we were all asked to move to a room where we would watch the test in a safe position. Once everyone was in the room a countdown began for the sled, as the countdown finished the sled

With the nose absorbing the brunt of the impact the frame had very little damage, with just a wishbone mount slightly deformed. It wasn't enough to lose a wheel though.

shot passed our window and created an almighty bang as it collided against the wall, and bounced back to a standstill. All that preparation for a matter of a couple of seconds, which was all to quick for me, I couldn't really make out what had happened. But everyone else noticed our GoPro Camera fly into the wall. I'm not sure if a GoPro has ever been crash tested before but it certainly didn't pass, even though the camera looked fine!

Back to business and only when I saw the chassis in one-piece could I appreciate just what the front nose had actually achieved. Obviously the nose had been crushed to literally nothing but you can see just from looking at it: how it collapsed in stages and reduced the force of the impact. With the nose absorbing the brunt of the impact the frame had very little damage, with just a wishbone mount slightly deformed. It wasn't enough to lose a wheel though.

and locking into the area where the driver's legs would normally be, likewise no protrusions that could cause harm to the drivers feet either. The FIA target was for a 'max average deceleration of the chassis to not exceed 28g'. When Nick showed me the results they had an average of around 20g. This is a huge gap, and another great success.

So how do Radical's compare to other similar club race cars? Well, interestingly



Above: Nick Walford calmly awaits the final test of the day. Radical's latest nose has. This test would fire the SR8 into a solid wall of 30mph. Sounds slow but with just the nose and chassis absorbing the impact it created 20g. 5g below the required minimum pace figure of 25g.

these aren't tests a space-frame race car manufacturer needs to perform for club level competition... so Radical does need to do any of this. Granted, for its Le Mans cars they do, but for club racing there is nothing in place saying its cars need to pass any such test. This is truly an admirable notion, albeit in a way to attract new racing drivers to its race cars but even so, a worthy one.

Of course manufacturers probably wouldn't be able to afford such extensive testing and development - not to mention the test itself - but with the amount of drivers competing each weekend in untested cars, is it not time that this became a bigger issue? The people who race accept that motor racing is dangerous but is it now time for the manufacturers to have more of a responsibility to provide a car that is 'proven' to be safe? There is no doubt about the serious nature of accidents in motor racing events but if all our cars passed an FIA crash test with the kind of glowing report as a Radical's, motor sport would be a much safer hobby... ■

