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## Lessons learned from the Infineon crash

Posted by pixrken - 2008/07/02 12:34

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This is a continuation of my race report from our Infineon race.

<http://944spec.org/944SPEC/content/view/125/9/>

As with any track incident it's what we can learn from it to make us safer and to talk about it.

Here are some emails between us after the incident.

From: Ken

Hi Team,

I have to tell you this was the scariest event I ever attended since this was the first time a ambulance had to be dispatched. My hit with tire wall last year I wasn't even fazed and just race the next day.

I'm sure all of us are real thankful Greg is O.K. Murphy's law says you will always find a section of wall where it's concrete and not covered by tires.

Greg's injuries were relatively minor considering he hit a concrete wall at what the corner workers were estimating at 90 MPH, the secondary hit at the rear where it pop open the hatch was a tire wall.

Greg suffered a fracture on the 7th rib of his left side and a bruise on his left leg by the shin area.

My observations:

1. I believe the head/neck restraint system really prevented serious injury.
2. I'm guessing the bruise on the left leg was caused by coming into contact to the bolt-in cage. Even though it was padded it's still in relatively close proximity to the leg. That's why I like and use a custom cage where the A-pillar bar is welded to the door sill and further away from the body.
3. The injury to the rib can be minimized with a seat with shoulder containment where the shoulders take the load instead of the side of the body. Like Jim Foxx's seat.
4. Our race cars with the safety systems are real strong. I don't take this as a mindset of invincibility but a street car would have been disasterous.

Jim Foxx whose was also at the event

From: Jim

I will add to this. Thank God Greg was back at the track in the afternoon. A testament to the level of safety gear we are required to have and to the level of gear we choose to have.

Several comments:

Halo seats to contain side to side head movement. The nets allow MUCH more movement (and stress on the neck) than a halo seat.

Leg whip - This can be a serious problem leading to bruises and injury to the legs from banging into cages, tunnels and each other. My seat has optional extensions that extend down to help minimize leg whip. Some pro teams have even developed a center divider to help prevent banging of knees and ankles together. I have looked at that but did not incorporate it YET. I will be now.

Harnesses - having the best harness possible. The Team Tech harness that I use incorporates two leg straps that work like a climbing harness to provide anti-sub protection. I believe this provides better protection for men's vital parts in a frontal crash as the stress is on the thighs and not centered on (you know what) that a conventional sub strap does. It also provides pads on the sternum and groin to dissipate force for less bruising.

Cage - having the drivers side bars bend out into the gutted door will add 4 or 5 inches of crush room for the driver. This is a simple change allowed by rule.

Seat mounting - mount the seat on supports that are attached to the tunnel and the side frame rails. The floor pan can deform in a crash and allow the seat to move. This happened to an Az racer and let his helmet hit the outside bar on his roll cage. Of course, the seat won't be adjustable but having an adjustable seat means there is no seat back support anyway and that is a concern especially in a rear end collision.

Sorry to rant about safety issues but you guys are great to race with and to hang with. We all need to keep on each other

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about safety and Greg can attest to it being effective. Being back at the track Sunday afternoon! Wow!

Jim "Big Dog" Foxx

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## Re:Lessons learned from the Infineon crash

Posted by JerryW - 2008/07/02 13:09

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There is a good discussion (with pictures) on leg protection in this Rennlist thread

<http://forums.rennlist.com/rennforums/showthread.php?t=439858>

. I'm going to be looking into doing what KurtR pictures with his 3R SRT4 and I'm also looking into the Kirkey Head restraints that fit to the existing seats.

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## Re:Lessons learned from the Infineon crash

Posted by joepaluch - 2008/07/02 13:14

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Wow,  
Greg glad to hear that you made it out in decent shape.

We must always remember that while we do this for fun safety gear cannot be overlooked.

You may remember your Mom saying to you as a kid "It all fun and games until some pokes an eye out!" Well same with racing.

Good sense, good maintenance and good safety equipment are critical elements when racing. Lets never forget that.

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## Re:Lessons learned from the Infineon crash

Posted by Chris - 2008/07/02 13:53

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scary stuff  
glad things turned out mostly ok.  
What type of bolt in cage was he using and how well did it hold up in the crash? id assume it did pretty well considering he got away with only a fractured rib but im asking because i have an autopower bolt in.  
thanks

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## Re:Lessons learned from the Infineon crash

Posted by pixrken - 2008/07/02 14:16

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I'm not sure which cage Greg has but the cage held up fine. There was no penetration into the occupant area. The rib was cause by movement of the body pushing against the seat in a impact even though he was strapped in tight. His Kirkey seat was not oversized and fit him pretty snug.

Greg has no memory of the incident but he feels the shin bruise was not cause by leg whip but by pushing in the clutch and the impact traveled from the clutch pedal up to his leg.

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## Re:Lessons learned from the Infineon crash

Posted by JerryW - 2008/07/02 15:13

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pixrken wrote:

I'm not sure which cage Greg has but the cage held up fine. There was no penetration into the occupant area. The rib was cause by movement of the body pushing against the seat in a impact even though he was strapped in tight. His Kirkey seat was not oversized and fit him pretty snug.

Greg has no memory of the incident but he feels the shin bruise was not cause by leg whip but by pushing in the clutch and the impact traveled from the clutch pedal up to his leg.

If this was Bill Pennok's old car I'm pretty sure the bolt in cage was an old Autopower (Probably ERW instead of DOM) and grandfathered in.

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## Re:Lessons learned from the Infineon crash

Posted by Gary\_44 - 2008/07/02 16:39

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That's a hard hit! Glad your OK Greg!

Can we get more specific detail of what safety equip was used?

A few questions:

- The seat looks way out of place, was it mounted through the floor? If so, did the floor deform that much or did the seat rip loose?
- What type of helmet/neck restraint/harness setup? I'd say it performed well considering no halo/shoulder restraint seat, but any recommended changes?
- Was the bolt-in cage mounted to welded bases on the door sills or sandwich plates in the floor?
- Was there any cabin deformity at leg level that might have caused injury? In other words, would a lower horizontal support from cage to left heel area (like Jim's car has) have made a difference?

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## Re:Lessons learned from the Infineon crash

Posted by pixrken - 2008/07/02 23:16

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Hi Gary,

I have to get a answer from Art regarding the seat since he's the one that's dismantling it. I think I have an idea but want to confirm.

Helmet was a Bell M3, head/neck restraint was a R3. It perform very well since Greg has no neck pains and in fact went in to work for a half day today.

If you want a break down of head/neck restraint systems in our group.

Greg, Jerry, Ron and myself use the Safety Solutions R3 type system. Steve, Sid, Aubie, Rick use the HANS.

I'm going to look at halo and shoulder systems.

The bolt-in cage which I confirm is a Autopower was mounted to the floor with sandwich plates. There was no cabin deformity at leg level that I can see so I can't comment on the lower horizontal support.

<http://944spec.org/gallery/InfineonJune2008/GregsAccident/Images/70.jpg>

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## Re:Lessons learned from the Infineon crash

Posted by Litespeeds - 2008/07/03 01:11

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That is an older Autopower bolt in cage with ERW tubing that was grandfathered in. The tube on that is around 1 3/4" if I am not mistaken and now the DOM is only 1 1/2". This cage didn't even have the additional front knee bar and it held up

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very well. I have heard the Nascar door bars is a good thing to have since it gives you additional distance before body contact. Also easier to get in and out of the car but you have to cut up your door in order to have this feature.

If anyone knows about safety, I believe Jim Foxx is the guy you should listen to. His posting will tell you pretty much everything you should or need to know about protection.

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## Re:Lessons learned from the Infineon crash

Posted by Sterling Doc - 2008/07/04 07:48

JerryW wrote:

There is a good discussion (with pictures) on leg protection in this Rennlist thread

<http://forums.rennlist.com/rennforums/showthread.php?t=439858>

. I'm going to be looking into doing what KurtR pictures with his 3R SRT4 and I'm also looking into the Kirkey Head restraints that fit to the existing seats.

I like the leg padding idea shown there - I'll be looking into doing that, as well.

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## Re:Lessons learned from the Infineon crash

Posted by pixrken - 2008/07/04 08:20

I spoke to Art yesterday.

There was no failure of the seat attachment with the bolts and backing plates.

The floor by the left rear seat bolt did deform and was depressed down about half an inch. That's the reason the seat points out towards the left.

Don't know if this cause Greg's head to contact the top of the roll cage to knock him out. Greg said there was no markings on his helmet.

This goes back to my first post where Jim Foxx recommends the seat mount to supports that are attached to the tunnel and the side frame rails.

I have thought about this before this incident and the reason why I ask Cullen or Chuck to get pictures of Hanksville's seat mount fabrication in this forum thread.

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## Re:Lessons learned from the Infineon crash

Posted by tcomeau - 2008/07/23 22:25

Hey guys,

After some lengthy discussions with a very experienced racer and car builder, I'm no longer supplying CRE built cars with a NASA legal roll cage. I'm building up the cars with what we call a "crash cage." It's way more than the rules minimums call for. We don't build them planning on the driver surviving only a high speed roll over, but rather, a high speed, multiple impact crash.

Everett Delano and Chris Allen in SoCal have both updated or replaced their cages with this idea in mind.

Yes, get the good roll cage padding and cover every bit of the cage you could possibly come into contact with. Arms, legs, ankles, knees, head.

I think the newer seats with the side head restraints are far superior to the inside net system alternative. The only short coming of the newer seats built to FIA rule 8855-1999 is that they don't need a seat back brace. The seat is MEANT to flex and absorb some of the crash energy. The problem is that if the seat rails or floor fail, the seat and driver can get stuffed under the horizontal bar of the cage in a hard rear impact. The shoulder belt holes make a nice weak spot in the seat so that it folds right there. My idea, which I've talked about before, is to build a wall of sheet steel straight down from the horizontal cage bar to the front edge of the rear seat area. This would be far enough away from the seat to give it room to flex, but it would also provide a solid barrier to the rear with enough surface area to keep the seat in one piece. One couldn't argue that this stiffens the chassis since it's already within the main hoop of the cage. There would need to be breaks at the top of this wall to mount the shoulder harnesses to the horizontal bar.

Can anyone see a problem with anything I've said so far?

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## Re:Lessons learned from the Infineon crash

Posted by tcomeau - 2008/07/23 22:28

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Also,

I wrote a thread or a reply to a thread a while back on the other forum about surviving a crash and making sure all your safety gear was easy to use. Make it easy for the corner workers to get you out!

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## Re:Lessons learned from the Infineon crash

Posted by joepaluch - 2008/07/24 06:43

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Tim,

if the wall connects only to the cage fine. If it connects to the tub in anyway it is another attachment point. I suggest making the lower attachment attach to additional cage elements rather than the tub. This way you don't create sheer panel in the cage which can stiffen the tub. You just stiffen the cage.

You can achieve this method with two horizontal cross bars. one at harness height and the other down low just so it crossover hump in the cage. then build your plate structure between the two. This way it only attaches to the cage.

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## Re:Lessons learned from the Infineon crash

Posted by Big Dog - 2008/10/19 00:56

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Tim, you talked about a "crash cage" that far exceeds NASA's requirements.

I also saw a post about building a bulkhead behind the seat to prevent it from being able to submarine below the harness bar in a rear end impact.

I would like to know more about your "crash cage" and how it is designed. Do you have any sketches or photos of what you have put into the crash cage? I am very interested in any improvements you have come up with. I like your idea on the bulkhead as well, Tim.

Every advance in safety helps us all.

Jim "Big Dog" Foxx

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