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## A Virtual Reality Ride/Game with Real Jet Fighter G-Forces

If you've ever ridden a roller coaster, you already know the different sensations the drops, turns, and upside-down loops push through your senses. During a normal roller coaster ride the physical location that you are moving through flashes through your visual cortex at a dizzying pace.

Wow! If you have experienced all of the above and loved it, you are going to really want to try the next generation roller coaster ride that is mostly likely coming to an amusement park near you. At a number of Six Flags amusement parks, new roller coaster experiences that combine the normal physical G-forces of

a black box controller is attached to each traveling roller coaster train. A sensor in this box actually counts the rotation of one of the wheels on the train and constantly sends this information, via Bluetooth, to all the Samsung Gear VR smartphones that are on the train. This guarantees that every drop, twist, and turn of the roller coaster remains perfectly synchronized.

The newest VR experience that Six Flags is rolling out at Magic Mountain and Discovery Kingdom, both located in California, is called "The New Revolution Galactic Attack." In this the first mixed-reality virtual world roller coaster experience you are

**Photo 1—Each rider wears a VR headset that matches the virtual experience to the g-forces they are experiencing. The riders touch a button on the left side of the headset to shoot at the alien drones.**



Photos courtesy Six Flags Entertainment Corp.

**Photo 2 (above)—As the riders complete this roller coaster loop, what they see and feel is shown in Photo 3.**

**Photo 3 (left)—The left image shows what riders visually see. The right image shows the g-forces they feel at the time.**



During the ride, sometimes the sky is the ground. The spinning of the world around you during the ride, coupled with the physical gyrations of the car, causes you to feel every sensation possible from fear to exhilaration. Beyond the physical pushes, pulls, and the sensation of momentary loss of gravity, you might also feel panic that the restraints will fail or the ride will crash.

the ride in perfect synchronization with a virtual reality (VR) experience are now being built. The VR part of these rides are powered by Oculus and viewed during the ride on a Samsung VR headset (Photo 1).

The VR experience through the headset stays perfectly synchronized to the location of the train throughout the ride (Photos 2 and 3). To make certain that they stay in sync,

piloting a fighter jet to stop an alien drone invasion.

As you fly through the experience, feeling the G-forces of the ride, you and your fellow passengers are given the ability to affect the outcome of

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**Photo 4—The pass through video, that is created in real time by the camera on the smartphone, allows the riders to see everything that is going on around them.**



teaser video to YouTube. It is available online at [youtu.be/WEQESXTdK-U](http://youtu.be/WEQESXTdK-U). The two leaders in this new technology are Oculus and Samsung and you can learn more about the experiences that both companies bring to the technology online at [www.oculus.com](http://www.oculus.com).

the battle. On the left side of the Samsung VR Headset is a button you press to shoot your weapons. You aim by moving your head to line up your target by centering the enemy in the middle of your field of vision. You can move your head left, right, up, or down to find your targets; when you fire and hit them they explode in glorious color.

Remember this is 360° personal viewing so where you look determines what you see. Your view through the headset includes a pass-through camera video which provides you with a real view of your surroundings while most of your view is in the virtual world (Photo 4).

To make things even more variable, there are three roller coaster bays and the trains that leave them each have a somewhat different virtual experience. This coupled with the quality of shooters on your train should create a dynamic VR experience.

So you don't leave the ride with germs from past riders, Sam Rhodes, Corporate Director of Design for Six

Flags informed me "that all parts of Samsung Gear VR that touch a rider's face and head are covered in an antimicrobial leather and cleansed between every use with antibacterial wipes" (Photo 5).

To get a true picture of what this experience entails, I have uploaded a



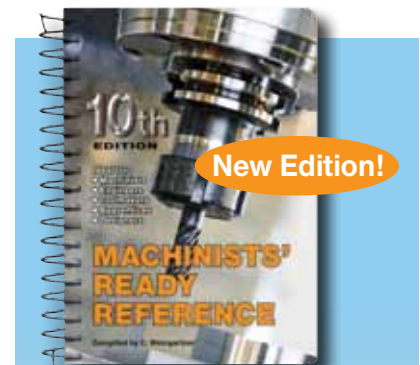
**Photo 5—After each ride, the VR headsets are thoroughly cleaned and checked for battery life.**

### Taking it a Step Further

1. If you were on the engineering team that created this roller coaster or the VR experience, what would you do differently to further enhance the mixed reality of the ride?

2. Tech Challenge: Your mission, if your teacher assigns it, is to get the most kinetic energy to drive your vehicle the furthest out of the potential energy of a 6' roller coaster-type initial drop. Specific design elements and construction materials will be determined by your teacher. ©

To view the teaser video, visit [youtu.be/WEQESXTdK-U](http://youtu.be/WEQESXTdK-U).



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