



*“Eaton provided us with a great hydraulic system design, and no revisions have been needed since its initial development 20 years ago. Eaton motion bases are among our most successful entertainment products.”*

—Mike Frueh, SimEx-Iwerks Vice President and General Manager

## Eaton's Hydraulics Group and SimEx-Iwerks Mark 20 Years of Thrilling Theatergoers

### Location:

United States, Canada

### Segment:

Entertainment

### Challenge:

Designing a compact, extremely quiet and reliable motion base that would simulate a wide range of movements portrayed on a theater screen

### Solution:

Designing a hydraulic system for a compact motion base that required three degrees of freedom

### Results:

Original Eaton hydraulic system design has been in use for 20 years

### Contact Information:

John Kostyal  
Eaton's Hydraulics Group  
(510) 521-3548  
JohnKostyal@eaton.com

### Background

Every day thousands of people take adventure thrill rides with a glimmer of Hollywood, thanks in part to the hydraulics wizardry of Eaton's Hydraulics Group.

2009 marks the 20th year that Eaton has worked with SimEx-Iwerks Entertainment to entertain global audiences through motion-based seating powered by Eaton hydraulics components.

In fact, during the last two decades, Eaton has supplied SimEx-Iwerks with over 2,000 motion bases for its TurboRide™ two-seat, three-axis motion system. The twist-'em and shake-'em theater-style seating system is featured in amusement parks, museums, shopping malls, zoos, and more.

Eaton motion bases provide the animation for the motion

seating that syncs with action on the screen. Supplied by Eaton's Packaged Systems group in Memphis, Tennessee, each motion base is equipped with Eaton® vane pumps, cylinders, valves, manifolds, hoses, and fittings.

The motion seating is part of SimEx-Iwerks highly entertaining motion-picture presentations that marry proprietary 3-D projections and 4-D special effects with blockbuster films produced by SimEx-Iwerks. To date the entertainment giant based in Toronto, Ontario, and Los Angeles, California, has installed over 300 attractions in 42 countries.

### Challenges

John Kostyal, Eaton area sales manager, has been working since day one of Eaton's involvement with SimEx-Iwerks. He recalls that the customer presented Eaton

with its motion base concept—and a tall order.

“SimEx-Iwerks' specs called for a compact, extremely quiet system that would be capable of simulating movements varying from bone-jarring vibrations experienced by a driver in a NASCAR® race to subtle motions felt by a passenger in a hot air balloon,” Kostyal says.

“And since they would be used in show-after show, day-after-day, the motion bases needed to be highly reliable with minimum maintenance requirements.”

### Solution

Early on SimEx-Iwerks determined that in order to adequately jolt, jostle, and jerk theatergoers, the bases would need to have three degrees of movement, which could be accomplished by three sets of cylinders and proportional



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valves per motion base. With design parameters in hand and SimEx-Iwerks engineers nearby, Eaton engineers went to work to design the hydraulic package for the motion bases. Top priority was given to keeping the package within a compact envelope and sizing components for maximum performance.

The proposed hydraulic system included a Vickers® V10 vane pump and accumulator that powered the motion base. Three Eaton® NZ cylinders, featuring low-friction seals and an external electrical feedback transducer for loop closure, were specified to generate motions and interface with the SimEx-Iwerks control system, which would control three Vickers KDG4V3 proportional valves mounted on a MCD manifold. The manifold also contained an Eaton slip-in cartridge, relief, and unloading valves that would limit system pressure and unload the hydraulics between shows. Aeroquip® hose with Eaton ORS® hose fittings and adapters were specified to convey fluid throughout the system.

Kostyal notes that Eaton's ORS hose fittings and adapters were chosen to combat dynamics experienced during shows with seat vibration. "We explained to SimEx-Iwerks engineers that ORS

connectors provided by Eaton would help eliminate all vibration-induced fitting weepage, making them a great fit for the application."

### Results

Following prototype development and approval, SimEx-Iwerks released an order to Eaton and has been doing so ever since.

"Eaton provided us with a great hydraulic system design, and no revisions have been needed since its initial development 20 years ago," says SimEx-Iwerks' Mike Frueh, vice president and general manager.

"Eaton motion bases are among our most successful entertainment products."

The Eaton motion bases are completely assembled on custom weldments with an integral reservoir built to the customer's specifications. Each unit undergoes stringent testing that includes an extensive "break-in" period, and all fittings and bolts are torqued and marked with a reference line to facilitate routine inspections.

"Theater mechanics only need to make a quick visual inspection to confirm hydraulic and mechanical integrity," Kostyal says.



SimEx-Iwerks' largest project to date includes 75 TurboRide two-seat modules, each equipped with an Eaton motion base. The units are individually controlled for gentle to vigorous motion.



Eaton designed motion bases for the SimEx-Iwerks TurboRide feature vane pumps, cylinders, valves, manifolds, hoses, and fittings from Eaton's Hydraulics Group.

**Eaton**  
Hydraulics Group USA  
14615 Lone Oak Road  
Eden Prairie, MN 55344  
USA  
Tel: 952-937-9800  
Fax: 952-294-7722  
[www.eaton.com/hydraulics](http://www.eaton.com/hydraulics)

**Eaton**  
Hydraulics Group Europe  
Route de la Longeraie 7  
1110 Morges  
Switzerland  
Tel: +41 (0) 21 811 4600  
Fax: +41 (0) 21 811 4601

**Eaton**  
Hydraulics Group Asia Pacific  
Eaton Building  
4<sup>th</sup> Floor, No. 3 Lane 280 Linhong Rd.  
Changning District  
Shanghai 200335  
China  
Tel: (+86 21) 5200 0099  
Fax: (+86 21) 5200 0400