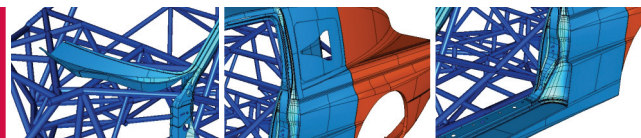


## Dakar Rally Raid racing pickup trucks ready in only ten months

Digital product development, including performance simulation, was key to the Nissan Rally Raid Team's outstanding finish in the brutal, transcontinental Dakar rally

Siemens PLM Software

[www.siemens.com/plm](http://www.siemens.com/plm)



### ► Issue:

Develop three vehicles for competition in the 2005 Telefonica-Dakar rally, just ten months away

### ► Approach:

Digitally model vehicle components in NX I-deas® software from the NX™ portfolio

Take advantage of seamless design-analysis integration to simulate components in a virtual environment

### ► Results:

Analysis results allowed best combination of speed, strength and weight

Delays and costs of physical models were avoided

Test-run at Baja Portalegre (Fall 2004) yielded first-place finish

Team captured fourth place honors at 2005 Telefonica-Dakar

## NISSAN RALLY RAID TEAM

- Nissan Rally Raid Team had just ten months to develop its entries for the 2005 Telefonica-Dakar, one the most challenging motorsports events on the planet.

### Digital development to meet tight deadline

The Nissan Rally Raid Team got started as a collaboration between two people in February 2004. Its mission: to develop three racing pickup trucks for competition in the 2005 Telefonica-Dakar rally, which would begin about ten months later on December 31, 2004. That gave the team a very brief window in which to build and test its vehicles and have them ready for one of the toughest races in the world.



The Telefonica-Dakar, formerly known as the Paris-Dakar, begins in Europe and ends in Africa. The starting and finishing sites vary, so the course is always different. And it is always brutal. Many entries do not finish; sometimes drivers are killed. Designing vehicles for this event requires finding a balance between speed, strength and weight. "Unlike production vehicles, we can't know the magnitude of the load these vehicles will be exposed to," explains Christophe Chapelain, technical director of the Nissan Rally Raid Team. "The load we have to prepare for is impact, such as when the driver makes a massive jump and hits a rock. The vehicles must be over-designed to some extent."

### A winning first try

Finding the perfect balance between the strength necessary for extreme impacts and the speed necessary to win the race could mean testing many physical prototypes. The Nissan Rally Raid Team had little time for that. Instead, it opted to perform vehicle development digitally. One of the team's first tasks after it was established was to choose a digital development environment. After evaluating a number of competing solutions, Nissan chose Siemens PLM Software technology primarily because of the seamless interface between its design and analysis applications.

**Solutions/Services**

NX

**Client's primary business**

Nissan Rally Raid Team placed fourth at the Telefonica-Dakar 2005. The team won the Baja Portalegre 2004.  
[www.nissan-motorsports.com/EN/RACE/DAKAR2005/MACHINE/index.html](http://www.nissan-motorsports.com/EN/RACE/DAKAR2005/MACHINE/index.html)

**Client location**

Paris  
 France

***“The seamless connection between NX design and analysis tools allowed us to use simulation to the fullest extent possible for optimizing the race vehicles.”***

*Christophe Chapelain  
 Technical Director  
 Nissan Rally Raid Team*

“Computer simulation was essential,” says Chapelain. “The seamless connection between design and analysis tools allowed us to use simulation to the fullest extent possible for optimizing the race vehicles.” In addition, Solutions F, a partner of Nissan Rally Raid Team for the engine, had been using software from Siemens for several years. “This reinforced our decision, as it would enable a transfer of skills between the two companies,” Chapelain adds.

Digital design work was done in NX I-deas. To create a digital version of the pickups, the team imported some existing geometry, such as that representing the gear box and other mechanical parts supplied by outside vendors. These came in the Catia, AutoCAD and SolidWorks formats and were smoothly imported into NX. The rest of the vehicle was also modeled in NX; in fact, approximately 90 percent – everything critical to performance – was eventually represented virtually. All this work was done by three designers. “We are a small team,” Chapelain says.

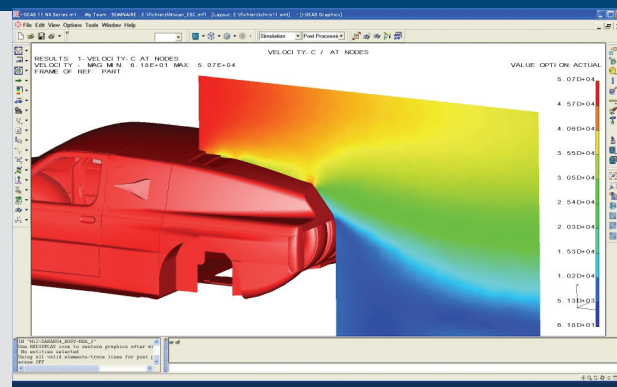
Critical components such as the roll cage, chassis and suspension were simulated using NX Nastran finite element analysis (FEA) capabilities. Results were used to optimize the components for strength and weight. The team also used FEA to make sure the vehicles met race regulations. For example, the windscreen was tested virtually to make sure it did not exceed the deflection limit. When the first test run showed a problem with the hub and ball joints, the team used NX Nastran capabilities to find the source of the problem, which was quickly fixed. Kinematics analysis was also performed to make sure all moving parts fit together and there were no interferences. “That way, when parts arrived from suppliers, we knew they would fit,” Chapelain says.

**Done quickly, done well**

The first race the team entered was the Baja Portalegre in October, 2004, which it won. The 2005 Telefonica-Dakar rally began in Barcelona on the last day of 2004 and finished in Dakar about two weeks later; 167 cars, 249 motor bikes and 69 trucks competed. The Nissan Rally Raid Team took home fourth-place honors.

The team credits NX with giving it time to optimize its vehicle design, in spite of the very brief and challenging development window. “It was a fast process, and really, really hard work,” says Chapelain. “NX was invaluable because of all the time it saved us. The tight integration between design and analysis let us evaluate more iterations and come up with an optimized design. This was only possible because we worked digitally.” The team plans to expand its use of NX to include thermal and aerodynamic analysis.

“Timing is everything in any form of motor sport,” concludes Chapelain. “Reducing the time it takes to get a new vehicle onto the track helped us build a championship winning machine. It was an immense achievement to put this winning pickup together in just ten months, and Siemens was instrumental in making it happen!”

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