

## AIR SUSPENSION SYSTEMS

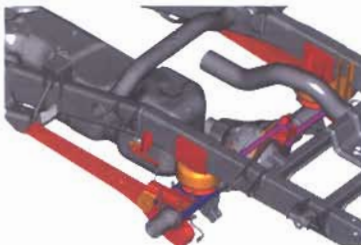
### FIRESTONE INDUSTRIAL PRODUCTS

In the highly competitive consumer pickup truck and light-commercial vehicle markets, load-carrying capacity represents both a performance and marketing advantage. The traditional ladder frame and leaf spring architecture used in these vehicle classes represents a significant compromise. As spring stiffness is increased to maximize load capacity, unladen ride is degraded, thereby compromising performance as a consumer-class vehicle that is often driven in unloaded state. Recognizing the desire to increase load-carrying capacity while simultaneously improving ride comfort, Firestone Industrial Products has prototyped an electronically controlled air suspension system to show what is possible with a full air suspension.

To demonstrate the benefits, FSIP set many specific targets and priorities: improved unladen ride, equivalent or improved laden ride, increased load-carrying capacity and equivalent or improved limit handling. Multiple suspension configurations were modeled, and the chosen configuration was two longitudinal links for fore-aft positioning and control of driving/braking torque, with a Watts linkage providing lateral location.

Vertical load is supported by rolling-lobe air springs that allow spring rate to be matched to the exact load case. The Firestone IntelliRide™ system, an electronic control system utilizing a proprietary ECM, is responsible for maintaining ride height in all conditions by monitoring sensors at each wheel position and controlling the compressor and valve block to manage air flow through the system.

Comprehensive testing of the vehicle used for demonstration has shown some improvements in unladen and laden ride quality (+1.5 and +3 points respectively), a significant improvement in limit handling, and a 60kg weight saving. Coupled with the leveling and kneeling functionality provided by an air suspension, these results suggest that the evolution of the pickup truck and light commercial vehicle is not complete.



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