Figure 2a shows the forces acting in the shoes of a simple leading-trailing drum brake. As shown, the friction force on the leading shoe causes it to be further loaded against the drum, increasing its effectiveness, while the friction force on the trailing shoe causes it to oppose the application force, decreasing its effectiveness.

In the duo-servo design, Figure 2b, the friction force of the primary shoe is used to apply the secondary shoe, thereby markedly amplifying the application force. The increase in brake loading due to friction is referred to as self-actuation, and this phenomenon can be used to increase the brake effectiveness. This design has been and still is used extensively on American cars using asbestos-containing brake linings.

Although the phenomenon of self-actuation can increase brake effectiveness, the effectiveness is strongly influenced by the frictional properties of the lining material. Figure 3 shows the relationship between brake effectiveness and lining friction coefficients for different drum brake designs and for an automobile disc brake. Duo-servo drum brakes are widely used in American automobiles, while leading-leading systems are found on many transit buses and heavy trucks. Leading-trailing systems are also found on most heavy trucks and on many automobiles. Assuming a nominal friction coefficient of 0.4, a 12-percent change in friction coefficient can alter the brake effectiveness by approximately 44 percent for a duo-servo drum brake, 33 percent for the leading-trailing drum brake, and only 12 percent for a disc brake. Figure 3 also shows that for automobile rear drum brake systems, friction materials qualified for use with duo-servo systems may not perform satisfactorily when used with leading-trailing systems. Conversely, materials qualified for use in leading-trailing systems may precipitate rear wheel lock-up when used with a more effective duo-servo system.

Aftermarket friction materials from different manufacturers can exhibit a wide variance in friction characteristics. This can lead to variable and unpredictable brake performance, even with materials containing asbestos. Under current law, aftermarket friction materials do not have to meet Federal Motor Vehicle Safety Standards.

As more major OEM friction material suppliers phase out asbestos materials, the burden of supplying materials for the aftermarket will fall on these secondary aftermarket suppliers. Under the proposed ban on