pressure brake applications, caused by relatively large brake pressure differentials between the trailers and converter dollies in multiple trailer combinations.

II. Sealco Petition

On June 18, 1993, Sealco Air Controls (Sealco), a valve manufacturer, submitted to NHTSA a rulemaking petition to amend Standard No. 121 with respect to the control line pressure differential requirements in S5.3.5. Specifically, Sealco requested that NHTSA amend these requirements to eliminate the need to modify the original design of its low opening valves (LOVs) that resulted from the August 1992 amendment. Sealco stated that these modifications degraded the ability of its LOVs to maintain minimal air pressure differentials between the input and output of these valves. These valves are used as control line relay valves and service line relay valves in trailers and converter dollies. The petitioner stated that unlike other relay valves that use a common poppet, ² the low opening valves have a balanced spool technology 3 that allows the valve to initially open at a relatively low pressure of 1.5 psi. The pressure at which a valve initially opens is referred to as the crack pressure. According to Sealco, the spool technology enables the output pressure delivered by the valve to closely follow (i.e., track) the input control air pressure. As a result, it claimed that hysteresis⁴ is not so prevalent with low operating valves as with high crack pressures. This amendment will not significantly affect small businesses, small organizations, and small governmental units that purchase vehicles since this amendment will have no significant cost impact on vehicles.

Hysteresis in a valve may cause the output line pressure of the valve not to track properly the input control line

³ A spool type valve has a cylinder which slides back and forth inside of a machined hole called a bore. As the spool slides past a port or opening on the side of the bore, the exposed side port then allows the air to flow past the valve spool.

⁴The phenomenon exhibited by a system in which the reaction of the system to changes is dependent upon its past reactions to change. With respect to braking, when the control line input pressure is increased, the relay valve's output (apply pressure) is usually a few psi lower than the control line output pressure, and is usually more than one or two psi above the descending control line pressure. Complications may arise when a subsequent brake application is made before the brakes have fully released after a prior application.

pressure, which may cause the application pressure of the brakes in the trailer to be significantly different than the control line pressure signal. In such situations, the valve's hysteresis may not allow the same pressure to be applied to the trailer brakes as is signalled by the driver's application of the brake control. In the case of increasing brake line pressure, this will cause less braking in the trailer than in the tractor, causing the trailer to "push" the tractor. Similarly, when the driver decreases the brake application, the hysteresis in the valve may not allow the brake application in the trailer to decrease to the same degree, resulting in the trailer brakes still being applied to a greater degree than those in the tractor. This causes the kingpin to jerk on the inside of the fifth wheel. Under high speed congested traffic conditions in which the driver may go through several brake applications and releases in rapid succession, the jerking and pushing of the trailer or trailers could be difficult to control. In multiple trailer combinations, this same phenomenon can be a problem between successive trailers as well as between tractors and trailers.

Sealco stated that the use of low operating valves would further NHTSA's goal of ensuring balanced braking in combination vehicles. However, the petitioner claimed that while its valve meets the amendment's application requirements, it does not meet the provision requiring release at high pressure ranges, given the valve's mechanics. To comply with the amendment, Sealco has drilled a hole in the valves' piston, thereby allowing pressure to bleed to the supply side. This action prevents the valves from cracking open when tested according to S5.3.5. Sealco believes that this modification to allow compliance with the amendment has reduced the valves' effectiveness.

III. Notice of Proposed Rulemaking

On July 13, 1994, NHTSA published a notice of proposed rulemaking (NPRM) proposing to amend Standard No. 121 to permit the use of low opening valves. (59 FR 35672) Specifically, the agency proposed to amend S5.3.5 to address input pressures over 40 psi. Under the proposal, the pressure differential would not be permitted to exceed 2 psi at any input pressure between 20 psi and 40 psi and would not be permitted to exceed 5 percent at any pressure over 40 psi. In other words, the pressure differential requirements would remain the same as the current requirements, except for

applications resulting in pressures over 40 psi.

In the NPRM, NHTSA explained that the current requirement may unnecessarily extend the 2 psi limit into the higher pressure ranges where it is not necessary for safety. The requirement is intended to prevent brake fade during relatively low brake applications below 20 psi. The 2 psi limit is relatively more stringent for hard brake applications, i.e., those exceeding 40 psi. The agency requested comments about whether the modification to pressure levels over 40 psi might be detrimental to safety or otherwise inappropriate.

IV. Comments on the NPRM

NHTSA received two comments on the July 1994 proposal to amend the control line pressure requirements. Mr. Robert Crail, a brake engineer, stated that "The adoption of the proposed amendment will not have any adverse effect on safety." He agreed with the agency that the greater problem area with pressure differentials is at the lower end of the pressure range and not the upper range, which is being broadened slightly. Advocates for Highway and Auto Safety (Advocates) criticized the proposal for several reasons. Advocates was primarily concerned that there was no real world braking data to support the amendment, which it believed would degrade heavy vehicle braking.

V. Agency Decision

After reviewing the comments and other available information, NHTSA has decided to amend Standard No. 121, with respect to the control line pressure requirements for converter dollies and trailers designed to tow other air braked vehicles. Specifically, the agency has decided to amend S5.3.4 to allow pressure differentials of up to 5 percent at pressures over 40 psi. The current 2 psi allowance is 5 percent of 40 psi, and the agency believes that allowing the same percentage above 40 psi is adequate. Based on its review of the available information, the agency has concluded that the amendment facilitates the use of an alternative technology, without being detrimental to safety. As it explained in the NPRM, NHTSA based the proposed requirement on the Society of Automotive Engineer's (SAE's) Recommended Practice J1505, Brake Force Distribution Test Code Commercial Vehicles. In addition, the agency also contacted all the major valve manufacturers about the pressure differential requirements. Based on its review, NHTSA believes that the 2 psi differential in the current requirement is

² A poppet valve has a valve seat like a typical water faucet valve. The air flow is increased as the sealing lip is raised higher off the valve seat by varying the air pressure in the control line. The valve allows increased or decreased air flow from the supply line side of the system.