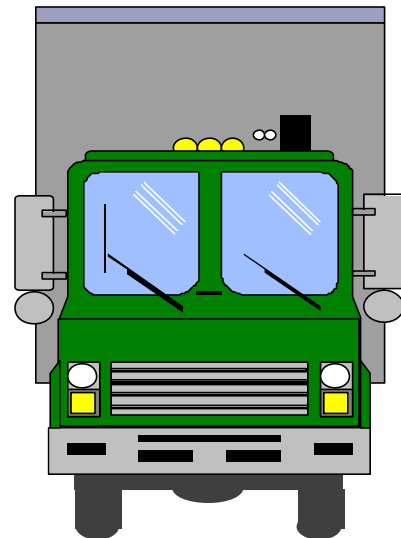


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# CHAPTER III

## Scenario Descriptions



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## Introduction

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The outreach process described in Chapter I identified a number of truck size and weight (TS&W) issues of broad interest. Those issues were incorporated into a set of illustrative scenarios that reflected changes in various Federal TS&W regulations. Potential impacts of those scenarios were analyzed against base case impacts of maintaining current Federal TS&W regulations. Figure III-1 shows the five illustrative scenarios analyzed in this study:

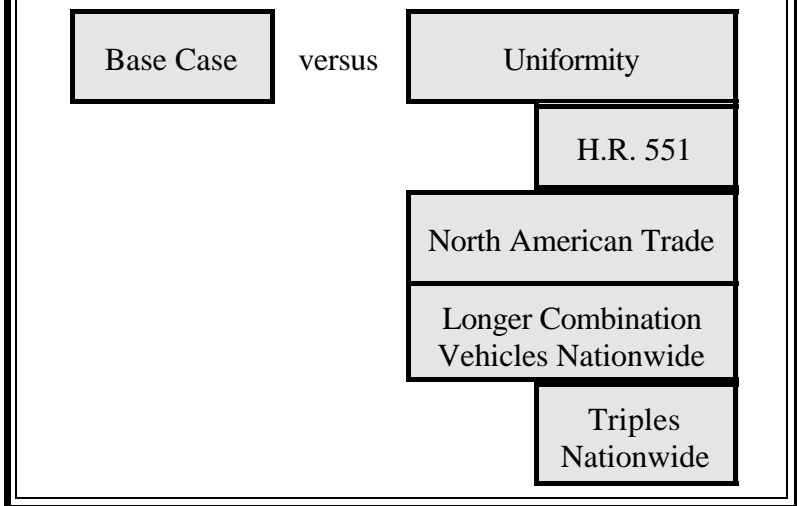
- Uniformity
- North American Trade
- LCVs Nationwide
- H.R. 551
- Triples Nationwide

The H.R. 551 and Triples Nationwide scenarios are subsets of the Uniformity Scenario and the LCVs Nationwide Scenario respectively. They are indented in Figure III-1 to show this relationship.

In addition, a Base Case was established against which the illustrative scenarios are compared.

These scenarios should not be construed as being indicative of the Department of Transportation's (DOT's)

**Figure III-1. Illustrative Truck Size and Weight Scenarios**



disposition toward a particular TS&W policy option. Rather, they were selected to illustrate potential impacts across a broad range of possible TS&W changes.

This chapter describes the illustrative scenarios in detail. The scenarios address a wide range of issues, and were specified to estimate the upper range of impacts that might be expected from various types of TS&W policy changes. Under different assumptions about the vehicle weights and dimensions that might be allowed under each scenario or the networks of highways that might be available for certain vehicles, the estimated impacts might be lower.

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## Base Case

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The Base Case provides a point of reference for the scenario analyses. It represents the motor carrier and rail industries in the year 2000, absent any significant changes in Federal or State TS&W limits.

## Introduction

The Base Case retains all features of current law. Federal size limits [102-inch maximum vehicle width, 48-foot minimum semitrailer length limits or longer if grandfathered (see Figure III-2), and 28-foot minimum trailer length limits for double-trailer combinations] remain on the Interstate System and other highways

on the NN. Operation of commercial motor vehicle combinations with two or more cargo-carrying units on the NN are restricted to length limits in effect on June 1, 1991.

The current Federal weight limits on Interstate highways and bridges [20,000-pound single-axle, 34,000-pound tandem-axle, 80,000-pound gross vehicle weight (GVW) cap, and Federal Bridge Formula (FBF)] continue, as do existing grandfather rights. Operation of LCVs on the Interstate Highway System, is restricted by State law in effect as of June 1, 1991.

The analysis year for the study is 2000. Projections of the truck fleet and truck VMT are based on trends from 1994, the base year for both this study and the *1997 Federal Highway Cost Allocation (HCA) Study*. Based on a review of many studies, the fleet and VMT were projected to increase at an annual rate of 2.6 percent a year between 1994 and 2000.

**Figure III-2. State Semitrailer Lengths on the NN**

The Surface Transportation Assistance Act of 1982 mandated minimum semitrailer lengths of 48 feet. However, in those States having semitrailer lengths longer than 48 feet, these lengths became the (grandfathered) minimum.

Alabama	53'6"	Montana	53'0"
Alaska	48'0"	Nebraska	53'0"
Arizona	57'6"	Nevada	53'0"
Arkansas	53'6"	New Hampshire	48'0"
California	48'0" *	New Jersey	48'0"
Colorado	57'4" *	New Mexico	57'6"
Connecticut	48'0"	New York	48'0"
Delaware	53'0"	North Carolina	48'0"
District of Columbia	48'0"	North Dakota	53'0"
Florida	48'0"	Ohio	53'0"
Georgia	48'0"	Oklahoma	59'6"
Hawaii	48'0"	Oregon	53'0"
Idaho	48'0"	Pennsylvania	53'0"
Illinois	53'0"	Puerto Rico	48'0"
Indiana	48'6" *	Rhode Island	48'6"
Iowa	53'0"	South Carolina	48'0"
Kansas	57'6"	South Dakota	53'0"
Kentucky	53'0"	Tennessee	50'0"
Louisiana	59'6"	Texas	59'0"
Maine	48'0"	Utah	48'0"
Maryland	48'0"	Vermont	48'0"
Massachusetts	48'0"	Virginia	48'0"
Michigan	48'0"	Washington	48'0"
Minnesota	48'0"	West Virginia	48'0"
Mississippi	53'0"	Wisconsin	48'0"
Missouri	53'0"	Wyoming	57'4"

\* King pin regulation applies  
Source: 23CFR 658, Appendix B

**Table 1. Base Year and Forecast Commercial Vehicle Fleet and Travel**

Vehicle Class	Number of Vehicles			Vehicle Miles Traveled (in millions)		
	1994	2000	Percent Share of Truck Fleet	1994	2000	Percent Share of Truck Fleet
3-axle single unit truck	594,197	693,130	24.9	8,322	9,707	7.6
4-axle or more single unit truck	106,162	123,838	4.4	2,480	2,893	2.2
3-axle tractor-semitrailer	101,217	118,069	4.2	2,733	3,188	2.5
4-axle tractor-semitrailer	227,306	265,152	9.5	9,311	10,861	8.5
5-axle tractor-semitrailer	1,027,760	1,198,880	43.0	71,920	83,895	65.4
6-axle tractor-semitrailer	95,740	111,681	4.0	5,186	6,049	4.7
7-axle tractor-semitrailer	8,972	10,466	0.3	468	546	0.4
3- or 4- axle truck-trailer	87,384	101,934	3.6	1,098	1,280	1.0
5-axle truck-trailer	51,933	60,579	2.2	1,590	1,855	1.4
6-axle or more truck-trailer	11,635	13,572	0.5	432	503	0.4
5-axle double	51,710	60,319	2.2	4,512	5,263	4.1
6-axle double	7,609	8,876	0.3	627	731	0.6
7-axle double	7,887	9,201	0.3	542	632	0.5
8-axle or more double	9,319	10,871	0.4	650	759	0.6
Triples	1,203	1,404	0.0	108	126	0.1

Characteristics of the Base Case commercial vehicle fleet are consistent with those in the *HCA Study*. The *HCA Study* provides VMT for selected vehicle classes disaggregated by weight group, highway functional class, and State.

The rail base case was projected to the year 2000 using the “International and Domestic Freight Trends” report by DRI/McGraw-Hill

and Reebie Associates. This report projects an annual growth rate for rail car miles of 2.2 percent to the year 2000. Rail intermodal car miles were projected to grow at 5.5 percent per year.

**Scenario Specifications**

The number of trucks estimated to be in the truck fleet and the extent of their use in 1994 and 2000 are shown in Table III-1 Only

those trucks likely to be impacted by changes in TS&W limits were explicitly considered in the study. Table III-2 shows characteristics of how those vehicles are currently used.

The impact that base year (1994) truck operations would have on infrastructure costs (bridge, pavement, roadway geometry), safety, traffic operations, energy and environment, shipper costs,

and rail industry competitiveness was compared to the impact that truck operations would have in 2000 if no significant TS&W policy changes occurred. This comparison shows how changes estimated to occur between 1994 and 2000, essentially due to growth in travel demand, would compare to impacts expected to result from TS&W policy changes in the year 2000 Base Case.

### **The Vehicles**

The truck configurations analyzed in this study and their current use in terms of areas of operation, length of haul, types of commodities carried, and highways used are described in Table III-2. The maximum weights and dimensions allowed for these configurations in each State have been modeled by dividing the country into six regions (see Figure III-3) and selecting the median weights and dimensions for the configurations from among the States in the region (see Tables II-2 to II-4 in Volume II). The regions are: Northeast (14 States), Southeast (9 States), Midwest (9 States), South Central (2 States), West (14 States), and California. Alaska and Hawaii have not been modeled as data were not available and they depend on

marine links for connection to the major U.S. truck and rail networks.

### **The Networks**

Single unit trucks (SUTs) and shorter single-trailer truck combinations have access to virtually all highways. "STAA" double trailer combinations and combinations with 48-foot semitrailers operate on a 200,000-mile network designated under the Surface Transportation Assistance Act of 1982 (STAA). Combinations with semi-trailers longer than 48 feet generally must comply with State routing requirements and provisions to minimize vehicle offtracking.

### **Access Provisions**

STAA combinations (vehicles authorized under the STAA legislation) are given access to terminals (points of loading and unloading) and service facilities (for food, fuel, rest, and repair) under State provisions that follow Federal regulations called for by the STAA. All States must allow access for STAA vehicles from and to the NN via any routes they can safely negotiate.

A myriad of TS&W regulations affects U.S. trucking operations. These differences reflect variations in economic and industrial activities, freight flow characteristics, infrastructure design and maintenance philosophies, system condition, traffic densities and modal options. Many believe that grandfather rights create enforcement problems. Also, there is concern that vehicles with potentially damaging axle weights may be allowed to operate under grandfather provisions. Equity issues are also important in that carriers in one State are afforded valuable operating privileges that are denied to shippers and carriers (and the industries they represent) in neighboring States. Finally, safety and congestion issues related to large trucks are of increasing concern to auto, as well as truck drivers. This scenario is designed to test the impact of removing the grandfather provisions and

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## **Uniformity Scenario**

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applying Federal weight limits to all highways on the NN. States that currently have higher weight limits on non-Interstate portions of the

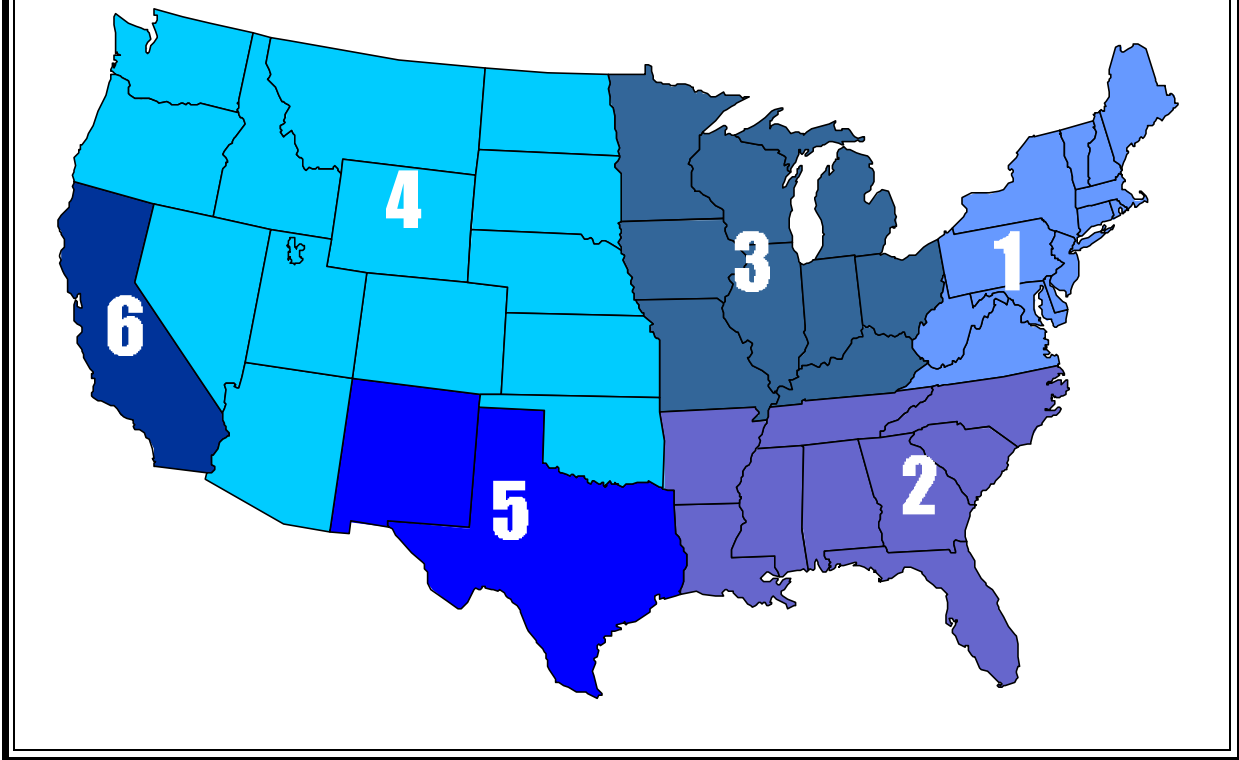
NN would have to lower those limits to the Federal limit, and the few States that have lower weight limits on non-Interstate portions of the

NN would have to raise their limits.

**Table 2. Current Use of Scenario Vehicles**

<b>Configuration Type</b>	<b>Number of Axles</b>	<b>Common Maximum Weight (Pounds)</b>	<b>Current Use</b>
Single-Unit Truck	3	50,000 to 65,000	Single-unit trucks (SUT) are the most commonly used trucks. They are used extensively in all urban areas for short hauls. Three-axle SUTs are used to carry heavy loads of materials and goods in lieu of the far more common two-axle SUT.
	4 or more	62,000 to 70,000	SUTs with four or more axles are used to carry the heaviest of the construction and building materials in urban areas. They are also used for waste removal.
Semitrailer	5	80,000 to 99,000	Most used combination vehicle. It is used extensively for long and short hauls in all urban and rural areas to carry and distribute all types of materials, commodities, and goods.
	6 or more	80,000 to 100,000	Used to haul heavier materials, commodities, and goods for hauls longer than those of the four-axle SUT.
STAA Double	5, 6	80,000	Most common multitrailer combination. Used for less-than-truckload (LTL) freight mostly on rural freeways between LTL freight terminals.
B-Train Double	8	105,500 to 137,800	Some use in the northern plains States and the Northwest. Mostly used in flatbed trailer operations and for liquid bulk hauls.
Rocky Mountain Double	7	105,500 to 129,000	Used on turnpikes in Florida, the Northeast, and Midwest and in the Northern Plains and Northwest in all types of motor carrier operations, but most often it is used for bulk hauls.
Turnpike Double	9	105,500 to 147,000	Used on turnpikes in Florida, the Northeast, and Midwest and on freeways in the Northern Plains and Northwest for mostly truckload operations.

Figure III-3. Truck Size and Weight Analysis Regions



### Historical Perspective

#### Grandfather Provisions

Current TS&W law includes three grandfather provisions which allow higher State TS&W limits than those indicated in the Federal regulations. The first, adopted in 1956, is concerned with axle weights and gross weights.

The second, enacted in 1975, deals principally with bridge formulas and axle spacing tables. The most recent grandfather clause was

created in 1991 and focuses on double-trailer or triple-trailer combination vehicles operating at weights greater than 80,000 pounds.

The Transportation Equity Act for the 21st Century did not change existing grandfather provisions. It did however, establish new grandfather dates, by special exceptions to the rules, for Maine and New Hampshire.

The Federal-Aid Highway Act of 1956 imposed axle and GVW limits for trucks operating on the Interstate

System. Because some States already allowed motor carrier operations at higher axle or gross weights, a grandfather clause was included in the legislation to preclude a rollback in those States.

The Federal-Aid Highway Amendments of 1974 (enacted in 1975) mandated that maximum weights for axle groups would be determined by a formula designed to protect bridges. A new grandfather provision was included in the 1975 legislation that allowed

States to continue to use alternative bridge formulas or axle spacing tables that allowed weights greater than the new Federal formula. The grandfather provisions in the 1956 and 1975 legislations have been interpreted to include exemptions for both permitted and non-permitted vehicles. Figure III-4 explains divisible and non-divisible permitting regulations and practices.

The Intermodal Surface Transportation Efficiency Act (ISTEA) of 1991 froze the weight, length, and routes of LCVs operating on the Interstate System as well as the lengths and routes of commercial vehicle combinations with two or more cargo carrying units operating on the NN. With this legislation, operations of LCVs, defined as any combination of a truck tractor and two or more trailers or semitrailers which operate on the Interstate System at a GVW greater than 80,000 pounds, are restricted to the types of vehicles and routes in use on or before June 1, 1991.

### **Uniformity Legislation**

The STAA of 1982 included

provisions that created more uniform TS&W standards nationwide. The act provided that Federal-aid funds would be withheld from States that enacted maximum weight limits lower than the maximums specified by Federal law. These limits are 20,000 pounds for single axles, 34,000 pounds for tandem axles, and GVWs determined by the FBF, subject to an 80,000-pound maximum limit.

It raised the maximum vehicle width limit from 96 inches to 102 inches, and, as amended, applied this limit to the NN, subsequently designated by the Federal Highway Administration and States, as required by the STAA of 1982.

It also set minimum length limits of 48 feet (or longer if grandfathered) for semi-trailers in a single-trailer combination and 28 feet for trailers in a double-trailer combination. It required the States to allow trailers these lengths or longer on their NN routes. However, the States are permitted to allow longer trailers. The STAA also required the States to provide reasonable access for these STAA vehicles between the NN and terminals and service facilities.

### **Scenario Specifications**

This scenario examines the impact of establishing State truck weight limits at the current Federal limits for all trucks operating on the NN. All State grandfather rights would be eliminated. Non-divisible load permits would continue. Off the NN, vehicles would continue to operate at current State-regulated weights.

### **The Vehicles**

Under the Uniformity Scenario, single unit trucks (SUTs) were analyzed as follows: (1) the maximum GVW for three-axle trucks would be 51,000 pounds and (2) the maximum GVW for four-axle trucks would be reduced to 56,500 pounds. These weights assume short wheelbase vehicles, with weights determined by FBF. This assumption may overstate the impact of this scenario because longer wheelbase vehicles could continue to operate at higher weights. Also, manufacturers would probably build longer wheelbase vehicles to



#### Figure III-4. Divisible and Non-divisible Load Permits

States grant special permits exempting eligible motor carrier operations from Federal gross vehicle weight (GVW), axle weight and bridge formula limits. Federal law authorizes all States to issue permits for non-divisible loads, and 21 States allow the operation of overweight divisible loads under grandfathered special permits. The interpretation of divisible versus non-divisible loads, however, varies from State to State.

In 1994, the Federal Highway Administration defined a non-divisible load or vehicle as one that exceeds “applicable length or weight limits which, if separated into smaller loads or vehicles, would (1) compromise the intended use of the vehicle . . . , (2) destroy the value of the load or vehicle . . . , or (3) require more than eight work hours to dismantle using appropriate equipment. . . .” (Part 658 of Title 23, Code of Federal Regulations).

However, because the definition is not commodity-specific and because States are left to interpret the definition in application, there is ambiguity about what loads qualify as non-divisible and, therefore, may be treated specially. For example, some States consider equipment that has been spot-welded to be divisible, while other States categorize such equipment as non-divisible. Further the burden of proof as to the effort required for dismantling lies with the applicant, and there is substantial variation between States as to the amount of proof required to demonstrate that dismantling a load requires more than eight hours of work.

The weights that can be allowed under non-divisible load permits are not restricted by Federal regulation. These permits are usually issued for a specific route, often for an individual trip. They may be issued for very high GVWs, but the number of axles required generally goes up with GVW. Examples of non-divisible loads include manufactured homes, boats, cranes, mining equipment, major pieces of machinery, construction equipment, and power plant components.

In contrast to non-divisible loads, divisible load permits apply to all other material. They are generally issued for regular operations at a specified GVW, usually on a quarterly or annual basis. These permits apply to either entire systems or specified roads and often include restrictions concerning seasons and weather extremes. About half of the States have claimed grandfather clause authority to issue divisible load permits for operations over 80,000 pounds GVW on the Interstate.

Many States allow divisible load permits for specific commodities that are important to the economic health of their State. It is often argued, however, that exemptions are also instituted

operate at higher gross weights.

All SUT unit and combination vehicle types would be affected because States would not have grandfather rights to allow operation of trucks with GVWs or axle loads greater than federally set limits. For example, a seven-axle truck-trailer combination, currently allowed under grandfather provisions in some States at a GVW of 105,500 pounds would be restricted to an 80,000-pound limit on

the NN. In those rare cases where weight limits are lower on the NN as compared to Interstate Federal limits, this scenario assumes that the weights would be increased. However, it should be noted that the modeling capability underlying the study is not sufficiently sensitive to this particular case.

The new limits would prohibit all LCVs from operating above 80,000 pounds, rendering them impractical for weight

limited loads but not cube-limited loads. For example, a seven-axle triple-trailer combination currently operating under grandfather provisions, at 115,000 pounds, would be required to operate under the 80,000-pound limit.

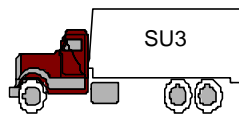
### **The Network**

The analysis network assumed for testing this scenario was the NN.

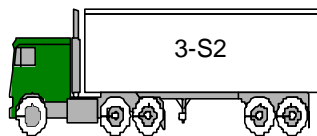
### **Access Provisions**

Access provisions are

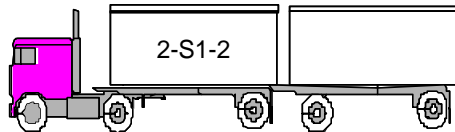
**Figure III-5. Uniformity Scenario**



Three-axle single unit  
51,000 pounds (maximum)



Five-axle semitrailer combination  
80,000 pounds (maximum)



Five-axle STAA double-trailer combination  
80,000 pounds (maximum)

### Main Feature

- Extend Federal gross vehicle weight limits on States beyond the Interstate to National Network (eliminates grandfather provisions)

### Available Highways

- National Network for Large Trucks

### Access Provisions

- Current Federal and State provisions

assumed unchanged from the Base Case.

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## North American Trade Scenarios

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The North American Trade Scenarios are focused on trade among the North American trading partners. Such trade could be facilitated by allowing the operation of six-axle tractor-semitrailer combinations at 97,000 pounds, which is sufficient to carry a container loaded to the International Standard Organization (ISO) limit on Interstate highways without a special permit (as would be required under today's regulations).

To provide for the operation of a six-axle tractor semitrailer combination at 97,000 pounds, a tridem weight limit of 51,000 pounds was tested. Currently, the weight allowed on a three-axle group is limited by the FBF. Introduction of a tridem weight limit would potentially impact the four-axle SUT as well as the eight-axle B-train double combination.

While the 97,000 pound six-axle tractor semitrailer

combination and the eight-axle B-train combination would have benefits in terms of trade, a tridem-axle weight limit of 51,000 pounds would have adverse bridge and safety impacts, especially for the short wheelbase 4-axle SUT. The three scenario vehicles were also tested with tridem axle weight limits of 44,000 pounds. A 44,000-pound tridem axle weight limit could provide a productivity increase for the scenario vehicles while limiting vehicle stability and control as well as infrastructure impacts.

A tridem-axle weight limit of 44,000 pounds would assume 20,000 pounds on the steering axle for an SUT, allowing up to 64,000 pounds GVW. For a six-axle semitrailer combination, 12,000 pounds is assumed for the steering axle and 34,000 pounds on the drive tandem, which would allow up to 90,000 pounds GVW for this configuration. For the eight-axle B-train combination operating at a GVW of 124,000 pounds, 12,000-pounds is assumed on the steering axle, 34,000 pounds on the drive axle, 44,000 pounds on the tridem axle of the first trailer and 34,000 pounds

on the tandem axle of the second trailer.

A tridem-axle weight limit of 51,000 pounds would assume 20,000 pounds on the steering axle for an SUT, allowing up to 71,000 pounds GVW. For a six-axle semitrailer combination, 12,000 pounds is assumed for the steering axle and 34,000 pounds on the drive tandem, which would allow up to 97,000 pounds GVW for this configuration. For an eight-axle B-train combination operating at a GVW of 131,000 pounds, 12,000 pounds is assumed on the steering axle, 34,000 pounds on the drive axle, 51,000 pounds on the tridem axle of the first trailer and 34,000 pounds on the tandem axle of the second trailer.

### **Background: Policy Related Issues**

#### **North American Trade**

The United States, Canada, and Mexico signed the North American Free Trade

Agreement (NAFTA) on December 17, 1992. Among other objectives, NAFTA is intended to promote competitiveness in the global economy and to provide for greater efficiency in transportation among the North American trading partners. By eliminating unnecessary barriers, the international transport of goods and services will be more efficient.

Figure III-6 compares the vehicle mix of the Canadian, American, and Mexican commercial vehicle fleets. The six-axle tractor semitrailer configuration is widely used in both Canada and Mexico. This vehicle is practical in Canada and Mexico because they have tridem-axle weight limits for a 12-foot spread that are considerably higher than the U.S. Federal limits (see Table III-3). The Canadian tridem-axle weight limit ranges from 46,297 pounds to 52,911 pounds, depending on how far apart the axles are spread. Mexico's tridem-axle weight limit is 49,604 pounds. Unlike Canada

and Mexico which establish tridem-axle weight limits by regulation, the U.S. does not legislate a tridem limit, rather it is specified by the FBF.

There are also significant differences in the single- and tandem-axle weight limits among the United States, Canada and Mexico. Table III-4 compares single- and tandem-axle weight limits in the three countries. The United States and Canada have very similar weight limits for single axles. Mexico, however, is 10 percent higher for tandem-trailer axles and 20 percent higher for tandem drive axles than its NAFTA partners. In the case of tandem axles, there is an almost 9,000-pound difference between Mexico's limit of 42,990 pounds for a truck or truck-tractor tandem-axle and the U.S. Federal limit of 34,000 pounds. Canada has an intermediate limit of 37,479 pounds.

This scenario tests the impact of allowing the six-axle tractor semitrailer at weights of up to 90,000

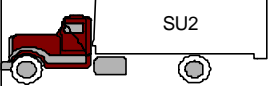
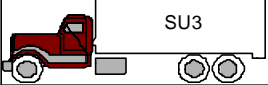
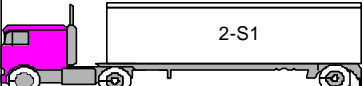
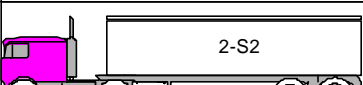
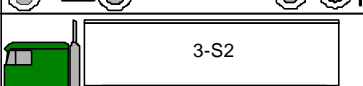
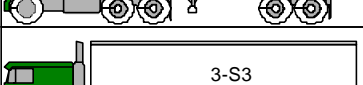
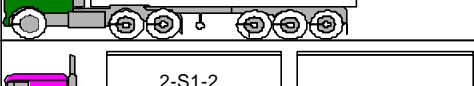
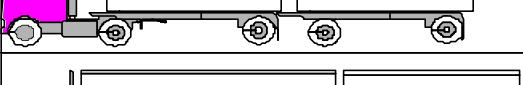

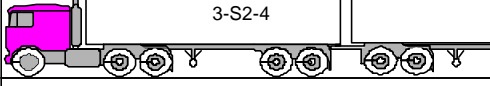
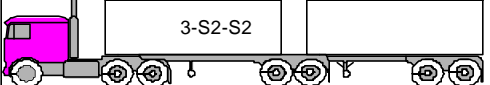
pounds (assuming a 44,000-pound tridem-axle weight limit) or 97,000 pounds (assuming a 51,000-pound tridem-axle weight limit). This would be accomplished by allowing a higher tridem-axle weight limit and raising the maximum GVW limit.

### **International Container Traffic**

International containers are a significant and growing feature of contemporary freight transportation. Over the 10-year period between 1987 and 1996, worldwide container port traffic grew 124 percent. In the United States, container movements grew 62 percent during the same period of time (see Table III-5).

An international container enters the United States through a marine port and is usually transported to a rail terminal or its final destination via truck. These containers can cause a vehicle to exceed the Federal axle and/or vehicle weight limits. When

**Figure III-6. Comparative Fleet Profiles -- Canada, United States, and Mexico**

Truck Configuration	Canada	United States	Mexico
 SU2	9.7%	35.5%	8.3%
 SU3	2.3%	4.9%	15.3%
 2-S1		1.6%	
 2-S2		5.5%	
 3-S2	51.0%	42.2%	35.2%
 3-S3	18.5%	3.0%	37.3%
 2-S1-2		2.7%	
 3-S2-2	5.2%	0.3%	
 3-S2-4		0.4%	2.5%
 3-S2-S2	5.3%		
 3-S3-S2	7.9%		
<b>Other Configurations</b>	0.1%	3.9%	1.4%

**Table III-3. Tridem Axle Weight Limits at Various Axle Spacings**

Axle Set	Canada	United States		Mexico
		Federal	State Max*	
8 feet	46,297	34,000	44,000	49,604
8+ feet	46,297	42,000	58,400	49,604
10 feet	50,706	43,500	58,400	49,604
12 feet	52,911	45,000	59,400	49,604

\* Grandfathered weights

**Table III-4. Maximum Single and Tandem Axle Weight Limits – Canada, United States, Mexico**

Axle Set	Canada	United States		Mexico
		Federal	State Max*	
Steering Axle	12,125	-	13,000	14,330
Single Trailer Axle	20,062	20,000	22,500	22,046
Single Drive Axle	20,062	20,000	22,500	24,251
Tandem Trailer Axle	37,379	34,000	44,000	39,683

containers, particularly 40-foot containers, are loaded to the weight limits established by the ISO—the principal international agency that sets standards for containers—they are generally too heavy for trucks governed by U.S. weight limits. Many of the NAFTA and European Community countries allow higher weights than the United States. is demonstrated in Table

III-6.

A 20-foot marine container can be loaded to a gross weight of 44,800 pounds by ISO standards and may cause a bridge formula violation in the United States. A 40-foot container can be loaded up to an ISO weight of 67,200 pounds and may cause U.S. axle, bridge and gross weight limits to be violated.

The Federal Highway

Administration allows, at State discretion, sealed shipping containers moving in international commerce to be carried at GVWs over 80,000 pounds under non-divisible load permits (see Figure III-7). However, this arrangement further exacerbates the variability in U.S. weight limits. This creates difficulties for foreign shippers that may not be

**Table III-5. Container Port Traffic**

Year	US Ports	World
1987	14,048	65,844
1988	15,252	73,810
1989	15,922	79,816
1990	16,651	85,957
1991	17,348	93,108
1992	18,627	102,906
1993	19,176	112,439
1994	20,230	128,320
1995	21,347	135,000
1996	22,788	147,348

Source: Containerization International, *Yearbook*, 1984-1997.

Thousands of Twenty-foot equivalent units

familiar with the variance in gross vehicle and axle load limits from State to State.

### **Four-Axle Straight Trucks**

A tridem-axle weight limit such as assumed in this scenario could also benefit short-wheelbase vehicles such as dump, refuse, ready mix concrete, farm and construction vehicles. Evidence indicates that FBF is overly conservative for short-wheelbase vehicles.

Tridem-axle weight limits of 44,000 pounds and 51,000 pounds are tested

for four-axle SUTs. Although the new limits provide for only somewhat higher payloads relative to what can be carried today, these short wheelbase truck operations would be able to carry the weight on a much shorter wheelbase without excessive infrastructure

impacts, particularly for bridges. As expected, the tridem-axle weight limit of 44,000 pounds is relatively more infrastructure friendly than would be the 51,000-pound limit.

It should be noted that, in many States, these SUTs have grandfathered limits above the Federal limits. For example in Maryland and the District of Columbia, three-axle dump trucks with a special registration permit may operate at weights up to 65,000 pounds regardless of their wheelbase. In the Eastern coal producing States, trucks for hauling coal generally are allowed to operate legally on designated highways or with a permit at weights above the Federal limits.

### **Figure III-7. Non-divisible Load Permits for International Containers**

The Federal Highway Administration made a policy decision in the early 1980's to allow goods transported in international containers to be treated as non-divisible loads. Not all States utilize this provision. Some States require that U.S. Customs service container seals be broken and a portion of the contents be removed when overweight containers are detected.

**Table 6. International Standards Organization Container Capacity**

	Configuration	Weight Container Plus Cargo (pounds)	20-foot Containers Which may be Legally Transported	40-foot Containers Which may be Legally Transported
United States (without permit)	Five-Axle Semitrailer	80,000	1	0
	Six-Axle Semitrailer	80,000	1	0
Canada	Five-Axle Semitrailer	87,000	1	0
	Six-Axle Semitrailer	102,500	1	1
	Eight-Axle B-Train Double	137,800	1	1
Mexico	Five-Axle Semitrailer	97,000	1	1
	Six-Axle Semitrailer	106,900	1	1
	Nine-Axle Double	146,600	2	1
European Community	Five-Axle Truck Trailer	88,200	1	0
	Five-Axle Semitrailer	97,000	1	1
	Six-Axle Semitrailer	97,000	1	1

**Scenario Specifications**

**The Vehicles**

Figure III-8 summarizes assumptions in the North American Trade Scenario. The scenario tests the impact of introducing tridem-axle weight limits of 44,000 pounds and 51,000 pounds. These limits are applied to the four-axle SUT, the eight-axle B-train double combination and the six-axle semitrailer combination. The tridem-axle group has nine feet between the first and last axle in the group. If the

axles were to be spread more than this, pavement wear would increase while bridge stress would decrease. Conversely, if the nine feet were shortened, bridge stress would increase, while pavement wear would decrease.

The four-axle SUT with a 44,000-pound tridem-axle weight limit would be allowed to operate at a maximum GVW of 64,000 pounds and with a 51,000-pound tridem-axle weight limit, at 71,000 pounds GVW.

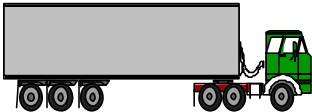
The eight-axle double trailer combination is assumed to operate with two 33-foot trailers. This vehicle, operating at weights in excess of 80,000 pounds, would most likely operate with a “B-train” connection (see Chapter 8 on Safety Impacts). These vehicles are assumed to operate at weights of 124,000 pounds GVW with a 44,000-pound tridem-axle weight limit, and 131,000 pounds GVW with a 51,000-pound tridem-axle weight limit.



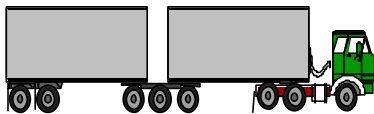
**Figure III-8. North American Trade Scenarios**



Four-axle single unit truck  
64,000 pounds or 71,000  
pounds maximum weight



Six-axle tractor-semitrailer  
90,000 pounds or 97,000  
pounds maximum weight



Eight-axle B-train double  
124,000 pounds or 131,000  
pounds maximum weight

**Main Features**

- **Combination vehicles widely used in Canada and Mexico**
- **Introduces tridem-axle weight limits**

**Available Highways**

- **Current National Network for STAA vehicles**

**Access Provisions**

- **Current Federal and State provisions**

network in the same States. For analysis purposes, the short-haul SUTs are not modeled using the study networks. In actual practice, these vehicles may travel anywhere, without restrictions. A more complete discussion of the analytical approach is contained in Chapter IV.

**Access Provisions**

The scenario assumes access provisions as in the Base Case, which implies access for eight-axle B-train combinations (with 33-foot trailers) to and from the NN.

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**Longer Combination Vehicles Nationwide Scenario**

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The maximum GVW allowed for a six-axle semitrailer would increase to 90,000 pounds or 97,000 pounds with tridem-axle weight limits of 4,000 pounds or 51,000 pounds, respectively.

**The Network**

The analysis network for the six-axle tractor semitrailer and the eight-axle B-train double is the NN. Rocky Mountain Doubles (RMDs) and

Turnpike Doubles (TPDs) are assumed to operate on their current routes. However, for analytical purposes, the trips for RMDs and TPDs have been routed through that portion of the 42,500-mile long-doubles network which is available in the 14 westernmost States, excluding Texas, New Mexico, California, Alaska and Hawaii. For triples, the roadway network that is modeled is the “LCV region” of the 65,000-mile

The ISTEA of 1991, which responded to public concerns regarding the safety of LCVs as well as concerns regarding rail competitiveness, included language to prevent the expansion of LCVs into States that did not permit them before June 1, 1991 (see Figure III-9).

The LCV Nationwide

### Figure III-9. The ISTEA Longer Combination Vehicle Freeze

The Intermodal Surface Transportation Efficiency Act (ISTEA) of 1991 imposed a freeze on States to restrict the operation of Longer Combination Vehicles (LCVs) on the Interstate System to the type of vehicles in use on or before June 1, 1991. The ISTEA defined an LCV as a combination of a tractor and two or more trailing units weighing more than 80,000 pounds that operates on the Interstate. This freeze was continued with the Transportation Equity Act for the 21<sup>st</sup> Century.

In addition to freezing the weights, lengths and routes of LCVs on the Interstate System, ISTEA froze the lengths and routes of commercial motor vehicles (CMVs) having two or more cargo units on the National Network for Large Trucks. A CMV is a motor vehicle designed or regularly used for carrying freight, or merchandise, whether loaded or empty.

Because of the freeze, States that did not allow LCV operations prior to June 1, 1991 are precluded from allowing them or from lifting restrictions that governed LCV operations as of that date. Such restrictions may include route-, vehicle- and driver- specific requirements.

Scenario explores the impact of lifting the ISTEA freeze. New Federal limits would be established and a network of highways upon which these vehicles would be allowed to operate would be designated.

Figure III-10 illustrates the common LCV combinations: the RMD, the TPD, and the triple-trailer combination. A diagram of the eight-axle B-train double is also provided, although this vehicle, given current TS&W laws, is far less common than the other LCVs. The figure also provides, for comparison, typical non-LCV vehicles.

The reader will note that a tractor, twin 28-foot trailer combination weighing less than or equal to 80,000 pounds is not considered an LCV. This vehicle, the STAA double (sometimes referred to as a Western double), is allowed to operate in all States and in 1994 accounted for approximately 2.5 percent of all truck combinations and 4.5 percent of all truck combination VMT.

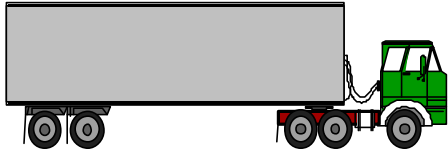
Figure III-11 illustrates that LCV usage is a regional phenomenon. Of the 21 States that allow the operation of LCVs, all but five are west of the Mississippi River. Some

of the eastern turnpike States (e.g., those allowing LCV operations only on turnpike facilities) have allowed LCVs for about 35 years. Some western States have permitted LCVs for fewer than 15 years.

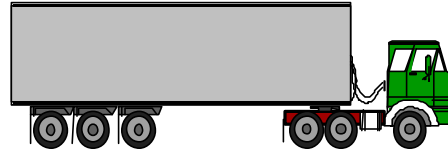
LCV operations are generally controlled through special divisible load permits. (See Figure III-12). These permits typically, but not always, include limitations specific to LCVs and may dictate equipment maintenance

**Figure III-10. Comparison of Longer Combination Vehicles With Conventional Trucks**

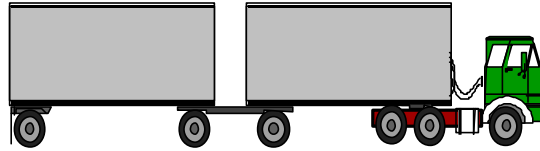
**Conventional Combination Vehicles**



5-Axle Tractor Semi-Trailer

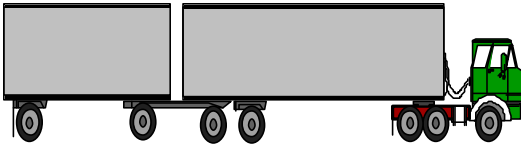


6-Axle Tractor Semi-Trailer

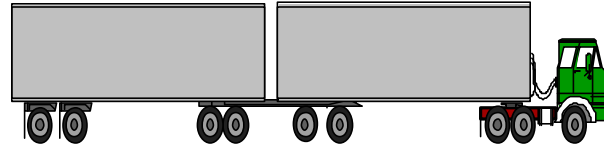


STAA or "Western" Double

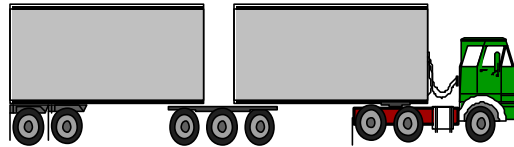
**Longer Combination Vehicles (LCVs)**



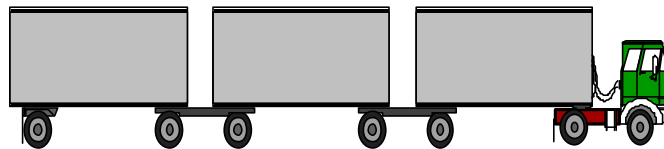
Rocky Mountain Double



Turnpike Double



8-Axle B-Train Double Trailer Combination



Triple Trailer Combination



### Figure III-12. Special Permits for Longer Combination Vehicles

Most States that allow Longer Combination Vehicles (LCVs) require special permits for their operation. These permits generally certify that (1) drivers have adequate and specialized training and experience, (2) the equipment is sufficient for handling heavier loads, (3) the carrier is properly insured, and (4) the vehicle is properly maintained and meets safety standards. State permits may be issued for single trips or on an annual basis.

In addition to these permit provisions, many States have special equipment requirements for LCV operations. These may include splash and spray suppression devices (such as mud flaps) and axle requirements. Other restrictions could include operating requirements such as minimum speeds, designated lanes, mandated distances to complete passing maneuvers and, load sequencing of the combination's trailers. Many States impose special driver requirements that are more extensive than those required for conventional trucks. These requirements may include minimum age limits and special training.

Special LCV permits often include route restrictions. Typically, these routes have, at a minimum, 12-foot lane widths, low to moderate grades, adequate space for executing turning maneuvers at intersections and curves, bridge load-bearing capacities necessary to tolerate heavier loads, suitable passing lanes, and a positive crash history.

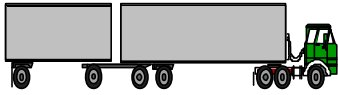
midwest began to issue permits for RMDs in 1959. Western States followed in the late 1960s. Today, RMDs operate over an extensive network of highways and toll roads in 21 States (six turnpike States and 14 western States). RMDs are generally used for general freight and short resource hauls. They are useful in freight delivery to more than one point on a route, because one trailer can be dropped at an intermediate point.

#### **Turnpike Doubles**

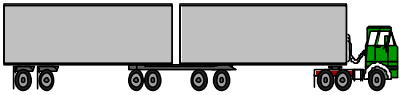
The TPD combination consists of a tractor towing two long trailers of equal length, typically from 40 feet to 53 feet in length. In the 1960s, several eastern States began permitting the use of these vehicles. Today, 19 States allow such operations. The TPD combination is allowed in all but three of the States in which RMDs are allowed to operate. These operations are generally, but not always, limited to Interstate and toll road facilities.

Compared to other LCVs, TPDs have more cubic capacity and can carry higher weights. TPDs are particularly well suited to operations where freight is moved from origin to destination without intermediate pick-up or delivery.

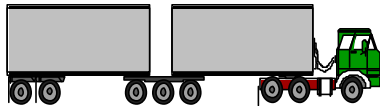
**Figure III-13. Longer Combination Vehicles Nationwide Scenario**



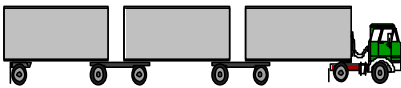
7-axle Rocky Mountain Double  
Maximum weight – 120,000 pounds



9-axle Turnpike Double  
Maximum Weight – 148,000 pounds



8-axle B-train Double  
Maximum weight – 124,000 pounds  
(33-foot trailers)



Triple-trailer combination  
Maximum weight – 132,000 pounds

**Main Feature**

- **Broad national LCV operations**

**Available Highways**

- **RMDs and TPDs – 42,000 mile analysis network**
- **Triples – 60,000 mile analysis network**
- **8-axle B-train double – National Network for STAA vehicles**

**Access Provisions**

- **RMDs and TPDs – none off the analysis network**
- **Triples – State issued permits**
- **8-axle B-train doubles – current Federal and State provisions**

**Triples**

A triple-trailer combination generally consists of a two- or three-axle truck-tractor and three trailers in tow. Each trailer is usually 28 feet to 28.5 feet in length. Triple-trailer combinations are usually restricted to maximum GVWs from 105,000 pounds to 129,000 pounds. Triples are permitted to operate in 14

States on limited networks (on highways in 11 States and on toll roads in three States). They are usually restricted to Interstate facilities and four-lane highways with low traffic volumes.

In 1994, total VMT for triple-trailer combinations was 108 million miles out of 99,177 million miles traveled by all combination vehicles. The predominant

users of triples are the less-than-truckload (LTL) industry and major package express carriers. This configuration allows the driver to drop off and pick up individual units at multiple points in a given run. In addition, LTL loadings generally fill up the trailer volume before they reach GVW limits. Therefore, they benefit from the additional cubic capacity.

## Scenario Description

The LCVs Nationwide Scenario estimates the impact of lifting the LCV freeze to allow LCV operations on a nationwide network. The LCVs would be afforded higher GVW limits (see Figure III-13). All other Federal size and weight controls would remain. The scenario assumes that all States would uniformly adopt the new limits, and therefore captures the maximum impact.

### The Vehicles

The longest and heaviest configuration tested in this scenario is the nine-axle TPD. It would be allowed to operate at weights of up to 148,000 pounds GVW and have up to twin 53-foot trailers. The other LCVs would also realize weight increases with the seven-axle RMD being allowed to operate at 120,000 pounds, the eight-axle B-train double at 124,000 pounds and the seven-axle triple-trailer combination at 132,000 pounds. RMDs are assumed to operate with 53-foot and 28.5-foot trailers. TPDs are assumed to operate with two 53-foot trailers. The eight-axle B-train is assumed to operate

with two 33-foot trailers.

### The Networks

The analysis of this scenario required use of all of the analytical networks described in Chapter II. The 42,500-mile long-double network was used to simulate travel by the RMD and TPD combinations. The more extensive (65,000-mile) analytical network was used to evaluate the operation of triple-trailer combinations. The eight-axle B-train double combination would be permitted to operate on the same network as STAA doubles which is the NN.

### Access Provisions

Because of poor offtracking (cornering) performance, the analysis does not allow long double-trailer combinations (TPDs and RMDs) off the designated analytical network. It is assumed that drivers of these vehicles will use staging areas—large parking lots—to disconnect the extra trailer and attach that trailer to another tractor for delivery to its final destination. Drayage is assumed to be along the most direct route off the network between the shipper or receiver and the network.

Staging areas are assumed at key rural interchanges and the fringes of major urban areas. Work completed for this study (see Chapter VII, Roadway Geometry) indicates that staging areas would be needed every 16 miles on rural freeways. On non-freeway rural highways, staging areas would be needed about every 50 miles. Urban staging area requirements are estimated to range from 2 to 14, depending upon the number of LCV routes approaching a given area. Typically, the analysis indicates that six staging areas are required for each urban area. However, some urban areas require significantly more, such as Dallas which would need twelve.

Trucks with trip origins or destinations in urban areas would use urban fringe staging areas, while through trucks would use the Interstate or other freeway system to their destination. The cost of these facilities is set forth in Chapter VII.

Triple-trailer combinations are allowed direct access, under a State-issued permit, to and from the network without disconnecting the trailers.

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## **H. R. 551 Scenario**

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H.R. 551, “The Safe Highways and Infrastructure Preservation Act,” was first introduced in 1994 during the 103rd Session of Congress, and again in 1997, as H.R. 551, during the 105th Session. The bill would federalize certain areas of truck regulation that are now State responsibilities. This scenario is a subset of the Uniformity Scenario described earlier.

H.R. 551 contains three provisions related to Federal TS&W limits: (1) it would phase out trailers longer than 53 feet, (2) it would freeze State grandfather rights, and (3) it would freeze weight limits (including divisible load permits) on non-Interstate portions of the NHS. However, only the first provision was analyzed.

### **H.R. 551 Provisions and Background**

#### **Phase Out of Trailers Longer than 53 Feet**

The proposed legislation would repeal provisions of the STAA of 1982 which grandfathered all trailer

lengths longer than 53 feet that were in lawful operation in 1982. States would be prohibited from registering new trailers, containers or other cargo-carrying units longer than 53 feet for operation on the Interstate and those classes of qualifying NHS highways as designated by the Secretary of Transportation. Existing trailers, semitrailers and other cargo units longer than 53 feet or those manufactured up to one year after the date of enactment would be allowed to operate indefinitely.

This section of H.R. 551 is intended to prevent the proliferation of very long semitrailers. It has been asserted that trailers longer than 53 feet are relatively more dangerous than shorter trailers because of off-tracking and swing-out lane encroachment. Further, some maintain that if these longer trailers jackknife they are more likely to hit other vehicles.

As shown in Table III-7, ten States currently permit the operation of semitrailers that are over 53 feet long. Six of the ten States limit the operation of these longer trailers to the NN (which includes the Interstate).

### **Termination of State Determination of Grandfather Rights**

H.R. 551 includes a provision, closely modeled on the ISTEA LCV freeze, which would codify and freeze all Interstate System grandfather rights. The proposed legislation requires the FHWA to publish a list of vehicles or combinations which were lawfully operating at weights over the Federal Interstate weight limits before January 1, 1997. This list would be by route, commodity and weight.



**Table III-7. States Routinely Allowing Semitrailers Longer Than 53 Feet**

State	Length Limit
Alabama	57 feet
Arkansas	53 feet 6 inches
Arizona	57 feet 6 inches
Colorado	57 feet 4 inches
Kansas	59 feet 6 inches
Louisiana	59 feet 6 inches
New Mexico	59 feet 6 inches
Oklahoma	59 feet 6 inches
Texas	59 feet
Wyoming	60 feet

State authority to determine weight limits under the 1956 or 1975 grandfather clause—as provided for by the Symms Amendment (see Figure III-14)—would be repealed. The freeze would not prohibit any of the existing exceptions to Federal limits, but would constrain States to the existing limits. This would apply to both permitted and non-permitted limits.

**Freeze on National Highway System Weights**

H.R. 551 proposes a freeze on non-Interstate NHS weight limits, greatly

expanding Federal authority to regulate truck weight limits. The freeze would also apply to divisible load permits. At present, States establish vehicle weight limits for their highways other than those on the Interstate System.

For roads, where vehicle weight limits are determined by the Federal government, the proposed weight limit freeze would increase the number of road miles from 44,000 miles (the current Interstate System) to almost 156,000 miles (the NHS). This proposal would effectively eliminate all State flexibility to allow higher

vehicle weights.

**Scenario Specifications**

Figure III-15 summarizes key provisions of this scenario. The scenario has been proposed to preclude States from raising their TS&W limits prospectively. A review of changes in State TS&W laws over the past ten years revealed that such increases have not occurred except in a limited number of cases involving specific commodities or truck configurations. For example, the kinds of divisible load permits have not changed appreciably over the last ten years. However, the number of permits issued has increased (see Table III-8).

This observation is not surprising since the ISTEA freeze has been in place since 1991. The analytical implication, in terms of this study, is that the only feature of the H.R. 551 proposal that can be modeled is the limitation on trailer length. It is

### Figure III-14. The Symms Amendment

The Surface Transportation Assistance Act (STAA) of 1982 provided more uniform truck size and weight standards across the country by requiring States to raise weight limits that were lower than the Federal standard. Prior to this there was no Federal legislative provision that would prevent the States from enforcing lower limits.

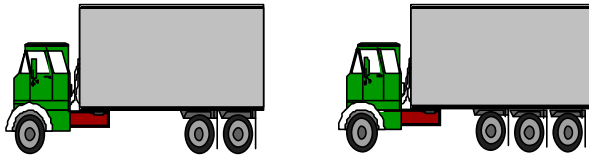
The STAA of 1982 also gave States added authority to determine their own grandfather rights. A provision introduced by Senator Symms, allowed the States to determine which “vehicles or combination thereof... could be lawfully operated within such State on July 1, 1956.” Some States have argued, based on this legislation that they are the sole arbiters of their grandfather rights. As a result of this legislation, ten States have claimed grandfather

**Table 8. State Permitting of Overweight Loads – 1985-1995**

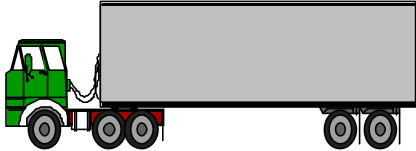
Year	Divisible Single	Divisible Multiple	Divisible Total	Nondivisible Single	Nondivisible Multiple	Nondivisible Total	Total Permits
1985	62,810	90,832	153,642	1,072,776	46,451	1,119,227	1,272,869
1986	53,976	96,193	150,169	1,149,625	59,274	1,208,899	1,359,068
1987	51,824	102,759	154,583	1,136,649	67,132	1,203,781	1,358,364
1988	64,955	112,801	177,756	1,151,732	61,222	1,212,954	1,390,710
1989	67,194	136,267	203,463	1,205,394	76,687	1,282,081	1,485,544
1990	73,270	140,697	213,967	1,321,261	88,362	1,409,623	1,623,590
1991	163,228	160,914	324,142	1,259,176	66,848	1,326,024	1,650,166
1992	184,711	162,040	346,751	1,347,773	92,734	1,440,507	1,787,258
1993	160,847	166,865	327,712	1,325,802	104,870	1,430,672	1,758,384
1994	157,114	198,236	355,350	1,426,143	116,934	1,543,077	1,898,427
1995	169,013	211,502	380,515	1,543,270	106,746	1,650,016	2,030,531

Source: FHWA Annual Inventory of State Practices, Overweight Vehicles—Penalties and Permits, FY85-FY94; and FY95 Annual State Certifications

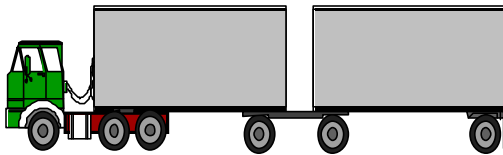
**Figure III-15. H.R. 551 Scenario**



Two to four-axle single unit truck  
Current law at 54,000 pounds to 70,000 pounds



Five to six-axle tractor-semi trailer  
Current law at 80,000 pounds to 100,000 pounds



Five to six-axle STAA double trailer combination  
Current law at 80,000 pounds

**Main Features**

- **Phases in elimination of semitrailers over 53 feet long**
- **Assumes status quo weights**

**Available Highways**

- **National Highway System**

**Access Provisions**

- **Current Federal and State provisions**

impossible to predict what States might do in the future with respect to changing their TS&W limits, since a meaningful historical trend does not exist.

**The Vehicles**

H.R. 551 would phase out all semitrailers longer than 53 feet. These trailers are used primarily to transport low-density freight that benefit from the additional cubic capacity. The pro-

posed legislation would not impact other equipment.

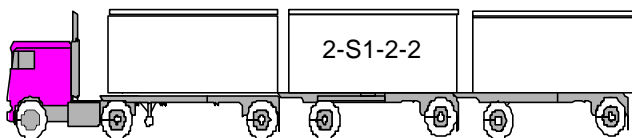
Because the longer trailers in use today would be grandfathered, the analysis assumes that these trailers would remain in use indefinitely. The analysis also assumes that the additional increment of freight that longer trailers would have hauled in the 2000 analysis year will have to be carried in the shorter, 53-foot trailers.

**The Network**

This scenario does not include any change to the status quo. It is notable, however, that an NHS weight-limit freeze would not create an incentive to increase weight on roads off the NHS because relatively little freight is transported between origins and destinations for which non-NHS routes are practical.

**Access Provisions**

**Figure III-16. Triples Nationwide Scenario**



Seven-axle triple-trailer combination  
132,000 pounds (maximum)

**Main Feature**

- Broad national operation of triple-trailer combinations and new weight limits for triple-trailer combinations

**Available Highways**

- 65,000-mile system

**Access Provisions**

- State issued permits

Current Federal and State access requirements would remain in effect.

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## **Triples Nationwide Scenario**

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This scenario, a subset of the LCVs Nationwide scenario, would permit the operation of triple-trailer combinations across the country.

### **Scenario Specifications**

Figure III-16 summarizes

key provisions of this scenario.

### **The Vehicles**

The Triples Nationwide Scenario focuses on the seven-axle triple-trailer combination which will be permitted to operate nationwide at a GVW of 132,000 pounds.

### **The Networks**

This scenario was tested using the 65,000-mile analytical network developed to test triple-

trailer combinations. The reader is referred to Chapter II for a discussion of this network.

### **Access Provisions**

Current State access provisions would remain in effect. Triple-trailer combinations are assumed to have direct access to and from the network without disconnecting the trailers, in accordance with State issued permits. Therefore, there is no requirement for staging areas.