Summary Report

U. S. TRUCK SIZE AND WEIGHT STUDY

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SUMMARY REPORT

U. S. TRUCK SIZE AND WEIGHT STUDY

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Scope of the Study

This paper summarizes our preliminary assessment of the impacts of several truck size and weight (TS&W) policy options on the motor carrier industry and its diverse segments. The focus of the study has been on the motor carrier industry and other industries that may be affected by truck size and weight policy. A portion of the study to be covered in another report also encompasses an assessment of other important factors affecting the motor carrier industry and prospects for future changes in the industry and its use of the highway system. The Federal Highway Administration (FHWA) will also be performing all of the important highway impact analyses (pavements, bridges, safety, etc.) that are necessary to form a comprehensive assessment of the TS&W policy options.

Policy Options Evaluated

Five potential changes in U.S. regulation of truck size and weight limits are being evaluated, as defined below:

1. Elimination of the grandfather clause on weight limits for vehicles operating on the Interstate System

Under this option, all vehicles operating on the Interstate System would have to adhere to the existing Federal limits of:

- 20,000 pounds on single axles
- 34,000 pounds on tandem axles
- Tridem axle limits governed by Bridge Formula B (42,500 pounds for a tridem with overall spacing of nine feet)
- Limits on any set of two or more consecutive axles governed by Brdge Formula B

- 80,000 pounds GVW (with exceptions only for the transport of indivisible loads)

2. Elimination of the 80,000 pound GVW limit and use of Bridge Formula B

Two suboptions have been evaluated:

2(a). Elimination of the 80,000 pound GVW limit and application of the Federal bridge formula to the Interstate System only

Doubles would continue to be allowed on the existing National Truck Network at current State size limits. Higher GVWs under Bridge Formula B would be allowed on the Interstate System (IS) plus very limited access, which we have assumed to average three miles for analysis purposes. This policy option was seen as providing very limited industry benefits, and was intended primarily as a basis for comparison with policy option #2(b) below. We recognize that if this option were actually enacted, many States would probably follow the Federal lead over a several year period by changing their weight limits off the IS to the new Federal IS limits.

2(b). Elimination of the 80,000 pound GVW limit on the Interstate System and extension of the Federal bridge formula application to a new truck network

The new truck network would consist of the Interstate System, plus all rural principal arterials, plus all urban principal arterials that are on the currently designated National Truck Network. We will refer to this as the principal arterial truck network.

Doubles would continue to be allowed to operate on the existing National Truck Network (NTN), and semitrailer combinations

would be allowed to operate on the principal arterial truck network. On the principal arterial truck network, GVW would be governed by Bridge Formula B.

3. Special equipment requirements for operation above 80,000 pounds under Federal Bridge Formula B

Two suboptions have been evaluated. Both are designated suboptions of 3(b) because they both involve elements similar to #2(b) above. However, Policy Option 3(b) adds special equipment requirements for all doubles operating above 80,000 pounds on the existing NTN. We interpret the existing grandfather clause as permitting the continued operation of doubles and triples at currently legal weights above 80,000 pounds without the special equipment requirements. That is, the special equipment requirements would apply only to doubles and triples operating in States at lengths and weights that are not currently legal.

3(b)1. The first suboption would require that all doubles and triples with GVWs above 80,000 pounds on the NTN have a minimum of three axles under each trailer and be operated in a B-train or C-train configuration (i.e., using either a rigid platform in place of a dolly or a double drawbar dolly).

The practical effects of this suboption, relative to Policy Option 2(b), are:

- Truckload carriers wishing to increase the weight of their loads would have one of the potential Policy Option 2 alternatives (5 axle twin 28s) replaced by a more expensive alternative (7 axle twin 28s).
- LTL carriers would not be able to use their 5 axle twin 28s to carry weight-limited TL shipments in loads above 80,000 pounds.

3(b)2. The second suboption of Policy Option #3 would require that twin 34 foot trailers (twin 34s) be allowed everywhere on the NTN,

with the same axle and hitching restrictions as in the first suboption.

Twin 34s would probably be attractive to most LTL operators. They could also be used for some portion of the TL movements between pairs of points that are on the doubles network; but they could not be used for TL movements with origins or destinations off this network.

4. A combination of Policy Options #1 and #3

The combination of Policy Option #1 with either suboption of Policy Option #3 is being evaluated.

5. Expansion of the NTN to include all rural principal arterials

This policy option is being analyzed to a lesser extent than the other policy options. The intent was to assess the relative importance of expanding the network in most States for doubles as compared to allowing higher weights for tractor-semitrailers on an expanded network. The basic definition of this policy option involves current Federal size and weight limits, but we have also attempted to ascertain the relative importance to carriers of having both an expanded doubles network and higher weight limits under the bridge formula.

Analytical Approach

Estimates of the effects of the scenarios were derived using the results of interviews and case studies of several motor carrier firms; information provided by other truck operators and industry observers contacted in the course of this study and other closely related studies we are performing; and analyses of the costs of operating various truck configurations that are currently in use or which could be used under the scenarios.

A unique aspect of the approach has been the use of in-depth interviews with a cross-section of firms selected to represent all major industry segments. Exhibit 1 provides a four page tabulation showing how the firms interviewed for this study and a closely related study for the Transportation Research Board (TRB) cover all major types of motor carrier operations.[1] Results of all the 30-plus in-depth interviews are being used in both projects as a key input to the procedures used in the forecasting process. The firms have been selected for both projects to assure coverage of all major types of commodities carried and several important specialized products (page 1 of the exhibit); types of equipment used (page 2); regions of the country (page 3); and (page 4) private and for-hire, different kinds of experience under the grandfather clause, and experience of certain selected types -- Canadian operations, advanced truckload firms (ATLFs), container hauling, and use of owner-operators.

The analytical procedure that has been used for most of the forecasting process (other than the base case forecasts and the modal diversion estimates) is unique in that it has been developed in large part as a direct product of the interviews and data that have been collected from the motor carriers during the study. The procedure is based on the assumption that all carriers will shift toward use of the most economical type of equipment, taking into account all important costs related to each type of equipment -- purchase price and operating costs, and the productivity improvements that might be realized by each type of equipment. The procedure takes into account all important constraints on the operation of each type of equipment, such as regional TS&W limits, the mix of commodities carried and different types of operation involved, the proportion of time the equipment is weight-limited,

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[1]The TRB project, the Productivity Analysis for the Truck Weight Study, is part of a Congressionally mandated study to be completed in October 1989. Case study reports are being prepared as part of that project for the firms interviewed.

EXHIBIT 1

INTERVIEWS AND CASE STUDIES

Name of Carrier	Commodities Carried: LTL Gen. Freight	TL Gen. Freight	Heavy Machinery	Petroleum Products	Refrigerated Products	Construction	Agricultural Products	Motor Vehicles	Building Materials	Forest and Mine Ores	Other Specialized
FHWA Study:											
Benjamin Moore											Paint
Mobil Oil				X							
Grt. Southern Plywood			X						X		Paper, Scrap
Bulldog Trucking		X							X		
Pacific Inland Transp.		X									
Grt. Coastal Express	X	X									
Air Prod. & Chemicals											Compressed Gases
George Transfer & Rig.									X		Steel, Aluminum
Kaibab Transportation			X	X					X	X	Paper, Scrap
Overnite Transportn.	X	X									Containers
Keystone Line		X							X	X	Textiles, Paper
Jones Motor		X									Steel
Matlack				X							Chemicals
Viking	X	X									
Wm. H. P., Inc.		X									Food, Bottles, Paper
TRB Study											
Driggs Corp.						X					
W. S. Hatch				X			X			X	Gases, Chem. Wastes
Lynden Transport	X	X			X		X			X	
EI Kane		X									Container
Ryder System		X		X				X			Leasing
Walgreens	X										Dept. Store
Natl. Mag. & Book											Mags., Books
Am. Pres. Domestic		X									Containers
Transystems							X			X	
Waste Management											Garbage, Trash
Sureway Transport		X	X						X		Steel
C. P. Trucks	X	X		X							Intermod, Chems.
Parker Refrigerated				X	X		X				
Keim Transport							X		X		
N & W Concrete						X					
Coors Transportation		X			X						
Midwest Grain Prods.							X		X		Liquid Food Prod.
Savage Industries										X	

(continued)

EXHIBIT 1 (Continued)

INTERVIEWS AND CASE STUDIES

Name of Carrier	Types of Equipment										
	Single Unit Trucks	Tractor-Semitrailers	Western Doubles	LCVs	Vans	Tanks	Dumps	Hoppers	Reefer	Flatbeds	Other Specialized
FHWA Study:											
Benjamin Moore	X	X			X	X					
Mobil Oil	X	X			X	X					
Great Southern Plywood		X			X					X	Drop Frame
Bulldog Trucking		X			X					X	
Pacific Inland Transp.			X		X						
Great Coastal Express		X	X		X						
Air Prod. & Chemicals	X	X				X				X	Tube Trailer
George Transfer & Rig.		X		X	X					X	
Kaibab Transportation		X		X						X	Log Trailer
Overnite Transportatn.	X	X	X	X	X						
Keystone Line		X			X						
Jones Motor		X			X						Hotshot Trailers
Matlack						X					
Viking	X		X	X	X					X	
Wm. H. P., Inc.		X			X						
TRB Study											
Driggs Corp.	X	X					X			X	
W. S. Hatch		X		X		X		X			Tube Trailers
Lynden Transport		X	X	X	X	X	X	X			B-Trains
EI Kane		X									Container Chassis
Ryder System	X	X	X	X	X	X	X	X	X	X	
Walgreens	X	X	X	X	X				X		
National Mag. & Book	X	X		X							
Amer. Pres. Domestic		X									Container Chassis
Transystems				X				X			
Waste Management	X	X									Trash
Sureway Transport		X		X	X					X	Tri-axles
C. P. Trucks		X		X	X						B-Trains
Parker Refrigerated		X			X				X		
Keim Transport		X								X	Spread-axles
N & W Concrete	X	X					X				Concrete Mix
Coors Transportation		X							X		
Midwest Grain Prods.		X			X	X					
Savage Industries				X				X			

(Continued)

EXHIBIT 1 (Continued)

INTERVIEWS AND CASE STUDIES

Name of Carrier	Regions									
		Middle Atlantic	Florida	Other Southeast	Michigan	Other Midwest	South Central	Western LCV	Other Western	Alaska
FHWA Study:										
Benjamin Moore	X	X	X	X	X	X	X		X	
Mobil Oil	X	X	X	X	X	X	X	X	X	
Great Southern Plywood	X	X	X	X		X	X			
Bulldog Trucking		X	X	X		X	X		X	
Pacific Inland Transport	X	X		X	X	X		X	X	
Great Coastal Express	X	X	X	X		X	X			
Air Prod. & Chemicals	X	X	X	X	X	X	X	X	X	
George Transfer & Rig.	X	X		X		X	X			
Kaibab Transportation	X	X	X	X	X	X	X	X	X	
Overnite Transportatn.	X	X	X	X	X	X	X	X	X	
Keystone Line	X	X	X	X	X	X	X	X	X	
Jones Motor		X		X	X	X				
Matlack		X		X		X	X	X	X	
Viking								X	X	
Wm. H. P., Inc.	X	X		X	X	X	X			
TRB Study										
Driggs Corp.		X								
W. S. Hatch	X	X	X	X		X	X	X	X	
Lynden Transport								X	X	X
EI Kane		X		X						
Ryder System	X	X	X	X	X	X	X	X		
Walgreens	X	X	X	X	X	X	X	X	X	
Natl. Magazine & Book		X	X	X		X	X		X	
Amer. Pres. Domestic						X	X	X	X	
Transystems								X	X	
Waste Management	X	X	X	X	X	X	X	X	X	
Sureway Transport		X			X	X				Canada
C. P. Trucks					X	X				Canada
Parker Refrigerated						X		X	X	
Keim Transport						X	X	X	X	
N & W Concrete		X								
Coors Transportation		X	X	X		X	X	X	X	
Midwest Grain Prods.		X	X	X		X	X		X	
Savage Industries								X	X	

(Continued)

EXHIBIT 1 (Continued)

INTERVIEWS AND CASE STUDIES

Name of Carrier	Private or For-Hire	Grandfather Clause Experience			Other Special Experience			
		Higher Axle Weights	Higher Gross Weights	Current Fed. Limits	Canadian Operation	ATLF	Container Operation	Use Owner-Operators
FHWA Study:								
Benjamin Moore	P	X	X	X				
Mobil Oil	P	X	X	X				
Great Southern Plywood	P	X		X				
Bulldog Trucking	H	X		X		X		
Pacific Inland Transp.	H		X	X				
Great Coastal Express	H	X		X				X
Air Prod. & Chemicals	P	X	X	X	X			
George Transfer & Rig.	H	X		X				
Kaibab Transportation	H	X	X	X				X
Overnite Transportatn.	H	X	X	X				
Keystone Line	H	X	X	X				X
Jones Motor	H	X		X				X
Matlack	H	X	X	X				
Viking	H		X	X				
Wm. H. P., Inc.	H	X		X				
TRB Study								
Driggs Corp.	P	X						
W. S. Hatch	H	X	X	X				
Lynden Transport	H		X	X	X			
EI Kane	H			X			X	X
Ryder System	H	X	X	X				
Walgreens	P	X	X	X				
Natl. Magazine & Book	H	X	X	X				
Amer. Pres. Domestic	H		X	X			X	X
Transystems	H		X	X				
Waste Management	H	X	X	X				
Sureway Transport	H		X		X			
C. P. Trucks	H				X			
Parker Refrigerated	H		X	X				
Keim Transport	H		X	X				
N & W Concrete	P	X						
Coors Transportation	P & H	X	X	X				X
Midwest Grain Prods.	P		X	X				
Savage Industries	H		X	X				

cube-limited, or both, and limitations of docks or storage capacity. Each basic type of operation in each region was treated differently, as appropriate.

The following sections provide discussions of the expected industry response to each of the scenarios and quantitative estimates of the effects on annual truck miles travelled, payload ton-miles, and total costs of private and for-hire motor carriage. Separate estimates are provided for combination trucks and for single unit trucks with three or more axles, for each of seven study regions. All quantitative estimates were developed using a base case derived from FHWA forecasts of 1995 VMT by State, vehicle configuration, and highway functional class, and reflect our estimates of 1995 costs expressed in 1988 dollars.

Although the estimates are derived using forecast 1995 traffic volumes, they actually are designed to represent the steady-state response of the industry to any change in weight limits; *i.e.*, they represent the situation that would exist in 1995 if the new limits had been in effect long enough for the industry to have acquired a fleet that has been optimized for operation under the new limits. Much of the estimated savings resulting from higher weight limits are likely to be obtained within two or three years of any change. However, carriers operating particularly expensive equipment and those having operations that can benefit only marginally from the new limits can be expected to take appreciably longer to modify their fleet to take full advantage of the new limits.

Policy Option 1: Elimination of the Grandfather Clause

Twenty-three States and the District of Columbia have at least one Interstate system (IS) axle-weight limit that is higher than the Federal standard, and 21 States allow at least some IS operation with GVWs in excess of 80,000 pounds.

The axle weight, GVW and bridge formula components of Policy Option 1 would affect primarily two very different types of vehicles. The 80,000 pound GVW limit would affect primarily longer combination vehicles (LCVs) and some single trailer combinations, while the bridge formula and axle weight limits would affect primarily single unit trucks.

The GVW Limit

Exhibit 2 shows the maximum GVW limits in effect on the Interstate system in those States with IS limits for divisible loads above 80,000 pounds. Twenty States have such high limits under the grandfather clause, and a 21st, Wyoming, has such limits under a Federally-sanctioned demonstration program (which has recently been extended by Congress to run through 1991). Most of the limits shown are between 100,000 and 129,000 pounds. The highest limit, 149,000 pounds in Michigan, is available only for 11 axle combinations. Seven States have high GVW limits only on toll roads; of these States, Pennsylvania's is for western doubles, while those in the other States are for nine axle turnpike doubles and, in some States, for other configurations as well. Arizona allows 111,000 pounds only on the short segment of I-15 which cuts across the northwest corner of the State.

The commodities most frequently transported as divisible loads in vehicles with GVWs over 80,000 pounds are petroleum products, mining products, logging and lumber products, agricultural products, chemicals, food products, and, in States that allow triples, mixed freight. This last category consists primarily of LTL shipments.[2]

Grain is transported at GVWs in excess of 80,000 pounds in Michigan and in several west central and western States. Vehicle

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[2] Data from a few states that classified most or all shipments as "mixed freight" were excluded from this review.

EXHIBIT 2

STATES WITH GVW LIMITS ABOVE 80,000 POUNDS
ON THE INTERSTATE SYSTEM

STATE	GVW Limit on Interstate System (pounds)	ROUTE LIMITATIONS
Arizona	111,000	I-15 only
Colorado	110,000	Excludes half of I-70
Florida	138,271	Florida Turnpike only
Idaho	105,500[1]	
Indiana	127,400	Indiana Toll Road only
Kansas	120,000	Kansas Turnpike only
Louisiana	83,400	
Massachusetts	127,400	Massachusetts Turnpike only
	99,000[1]	Other roads
Michigan	149,000	
Montana	105,500[1]	
Nevada	129,000[1]	
New Mexico	86,400	
New York	143,000	New York Thruway only
North Dakota	105,500	
Ohio	127,400	Ohio Turnpike only
Oregon	105,500[1]	
Pennsylvania	100,000	Pennsylvania Turnpike only
South Dakota	129,000	
Utah	129,000	
Washington	105,500[1]	
Wyoming	117,000[2]	

Sources:
American Trucking Associations, Motor Carrier Advisory Service, Alexandria, Virginia, updated through November 1987.

American Truck Associations, Summary of Size and Weight Limits, Alexandria, Virginia, July 1987.

[1]By permit.

[2]Under Federally approved demonstration program expiring 1991.

configurations used for this purpose vary with State regulations, but seven axle Rocky Mountain doubles (RMDs) are a common configuration in several northwestern States.

Logs and wood chips are hauled to sawmills and pulpmills in vehicles which may exceed 80,000 pounds, though lower GVWs are more common and only about five percent of these hauls make use of the Interstate system.

Reduction of maximum GVWs to 80,000 pounds would result in the elimination of seven, eight and nine axle doubles from the Interstate system (except for empty backhauls) and their replacement by five axle semis. There would also be some diversion to five axle semis of shipments now carried in five and six axle doubles at GVWs over 80,000 pounds; and most triple trailer LTL operations would be replaced by double trailer operations.

The effects on transport costs would vary by commodity, by configuration used, and by current GVW limit. Grain transport in a five axle semi at 80,000 pounds GVW costs about 25 percent more than the cost per ton-mile for transport in RMDs. Similarly, turnpike doubles with loaded GVWs of 127,400 pounds can carry about 41 tons, while five axle semis with an 80,000 pound GVW can carry only about 27 tons at about 25 percent higher cost per ton-mile.

In addition to increasing transport costs, elimination of the grandfather clause would cause some equipment now in use (e.g., high power tractors, and "pup" trailers used on RMDs) to lose some of their value.

The continuing increases in transport costs would ultimately be absorbed primarily by the producers or consumers of the affected commodities. Whether it is the producers or the consumers that are primarily affected would depend upon the structure of the market in which the commodities are sold. The effect on prices and on producer receipts would be greatest for those commodities for which

the cost of affected transport is significant relative to the value of the commodity, e.g., for low value commodities such as grain and sugar beets.

Although increased transport costs would be small in relation to product prices or gross receipts, they are larger when viewed as a percentage of net receipts. Accordingly, some producers could find their margins squeezed to the point that they might no longer find it profitable to compete in some markets. Other producers who might be unaffected by increased transport costs could be able to enter or to increase their share in these markets.

Limits Affecting Single Unit Trucks

The Federal axle weight limits are 20,000 pounds for single axles and 34,000 pounds for tandem axles. Under these limits, three axle single unit trucks cannot be operated at weights over 54,000 pounds. Also, the Federal bridge formula, Bridge Formula B, limits tridem axles with an overall spacing of nine feet to 42,500 pounds, so four axle single unit trucks cannot be operated at weights over 62,500 pounds.

For most single unit trucks, Bridge Formula B places even more severe constraints on GVWs. Three axle dump trucks normally have an overall axle spacing of 16-20 feet, a spacing that results in a limitation of 48,000-51,000 pounds under the bridge formula. Similarly, four axle dump trucks with overall axle spacing of 22 feet are limited to a GVW of 56,500 pounds.

Of the twenty-three States that allow trucks operating on the IS to exceed one or both of the Federal axle limits, some do so by substantial amounts; and several of these States and some others allow three or four axle trucks to operate at weights that exceed the bridge formula limits.

Heavy single unit trucks are used chiefly in applications requiring the maneuverability of such vehicles for off-road operation, primarily in the construction and mining industries. The effects on operators of single unit trucks due to elimination of the grandfather clause on the Interstate system will vary with existing weight limits under which these vehicles operate. Most affected single unit truck operators would usually find it more efficient to select non-IS routes than to limit loadings to conform to the lower IS weight limits. However, for some hauls, reasonable non-IS routings may not exist, primarily due to a lack of non-IS bridges across major bodies of water. Except in areas where such hauls are common and in States (e.g., Tennessee, Vermont, and Maine) in which the differences between the IS and non-IS weight limits are small, it appears likely that nearly all operation of loaded single unit trucks in affected States would occur off the Interstate system in existing equipment optimized for operation at the State limits.

Heavy single unit trucks are used almost entirely in applications in which truck is the only feasible mode, and usually in which single unit trucks are necessary. Hence, increased truck costs would have little or no effect on diversion to rail for commodities carried by single unit trucks.

Virtually all of the increased transport costs of construction materials will be passed on to the ultimate customer and will be reflected in increased construction costs. In relation to the cost of materials, these increased costs will be greatest for the lowest value materials: sand and gravel, crushed stone, and ready-mix concrete. A twelve percent reduction in GVW limits would typically result in an eight to ten percent increase in the delivered price of these three materials, and a four percent increase for asphalt concrete. An even more significant effect could be expected in the cost of removing excavated materials to landfill sites. Larger reductions in GVW limits would result in correspondingly larger cost increases.

The percentage cost increase in the delivered price of more expensive materials whose transport costs would be affected would be significantly less. Typical cost increases for brick would likely be only one-tenth as large as for sand and gravel.

In most of the affected States, increased costs for delivering materials to affected construction sites would result in little more than a one or two percent increase in the cost of highway and street construction and smaller increases in the cost of other types of construction.

Impacts of Eliminating the Grandfather Clause

Because of the large amount of existing equipment designed for operation at higher weight limits, it is presumed that, if this scenario were to be adopted, it would be phased in over a period of several years - perhaps by grandfathering certain existing equipment. The full effect of this scenario thus would not be felt until the new limits have been fully phased in and all grandfather rights have expired.

Preliminary estimates of the overall annual effects of eliminating the grandfather clause for vehicles operating on the Interstate system are presented in Exhibit 3. These estimates are currently being revised. Our final estimates will presume a level of enforcement conistent with that maintained by States with weight limits that currently correspond to the Federal limits. With this presumption, our final estimates are expected to be appreciably higher than those shown in Exhibit 3.

As Exhibit 3 indicates, elimination of the grandfather clause would result in a net increase in the VMT of heavy trucks of roughly 0.1 percent. This change consists of increases due to greater circuity for vehicles choosing to avoid the Interstate system and due to reduced loads carried by vehicles that continue

EXHIBIT 3

PRELIMINARY ESTIMATES OF ANNUAL IMPACTS OF POLICY OPTION 1: ELIMINATION OF THE GRANDFATHER CLAUSE

	Axle Limits	GVW Limits	Total
Truck Vehicle Miles of Travel (10^6)			
Overall	+70 (0.05%)	+20 (0.01%)	+110 (0.06%)
On Interstate System	-120 (0.3%)	-220 (0.5%)	-340 (0.8%)
Truck Payload Ton-Miles (10^6)			
Overall	+300 (0.03%)	-1000 (0.10%)	-700 (0.07%)
Modal Diversion	-----	-1400 (0.15%)	-1400 (0.15%)
Truck Freight Expenditures (10^6)			
Change in Vehicle Utilization	+$460 (0.2%)	+$510 (0.3%)	+$970 (0.5%)
Modal Diversion	-----	-$130 (0.1%)	-$130 (0.1%)
Subtotal	+$460 (0.2%)	+$380 (0.3%)	+$840 (0.4%)
Rail Freight Expenditures (10^6)			
Modal Diversion	-----	+$60 (0.2%)	+$60 (0.2%)
Rate Changes	-----	+$20 (0.1%)	+$20 (0.1%)
Subtotal		+$80 (0.3%)	+$80 (0.3%)
Total Freight Expenditures (10^6)	+$460 (0.2%)	+$460 (0.2%)	+$920 (0.4%)

N.B. Numbers in parentheses are percentages of 1985 base case values.

to use this system, balanced, in part, by diversion of some affected shipments to rail. Most of the net increase in VMT would occur as a result of reduced axle weight limits that would primarily affect three and four axle single unit trucks.

The diversion of traffic from the Interstate system to other roads would be appreciably greater than the net change in VMT. Overall, we estimate that heavy truck traffic on the Interstate system would decline by about 340 million vehicle-miles annually, nearly one percent of the base case value, and heavy truck traffic on other roads would increase by about 450 million miles. These changes would, of course, not be distributed evenly across the country, but would be concentrated in the States with high axle weight and GVW limits.

The reduction in GVW limits would result in the diversion to rail of some shipments currently being carried in trucks operating at high GVWs. As shown in Exhibit 3, estimated modal diversion of 1.4 billion ton-miles represents only about 0.15 percent of total truck traffic; however, it probably represents about ten percent of traffic affected by the reduction in GVW limits.

The increased cost of transporting affected shipments that would continue to be transported by truck would be about one billion dollars annually, about 0.5 percent of the estimated cost of all truck transport of goods. Transport costs for shipments diverted to rail would decline by an estimated $70 million annually, ($130 million reduction in truck and $60 million increase in rail transport costs, as shown in Exhibit 3). However, total logistical costs for these movements presumably would increase as a result of differences between the quality of rail and truck service. In addition, we estimate that the railroads would be able to obtain about $20 million annually in revenue by increasing rates that are currently being set to compete with over 80,000 pound truck transport. Much of the increase in rail rates is likely to

fall on grain transport. Overall, total truck and rail freight expenditures would increase by an estimated 0.4 percent.

Policy Option 2(b): Elimination of 80,000 Pound GVW Limit

We assume that most mines which ship in combination trucks would be served by the new National Truck Network (NTN) assumed for this suboption, as would nearly all manufacturing and trade facilities which ship or receive medium or high density goods in truckload quantities. The portion of grain elevators that would be served by an NTN would probably be lower, accounting for perhaps half of all highway shipments from country elevators. We expect that most sawmills and pulpmills would be able to ship their products over the NTN, but that few of the movements to these mills would be able to benefit from higher GVW limits. Overall, we assume that approximately 75 percent of truck movements which are now affected by the 80,000 pound cap could be made entirely via the NTN.

Vehicle Configurations, Payloads, and Transportation Costs

Removal of the 80,000 pound limit would permit weight-limited shipments now being carried in five axle semis and five axle western doubles to be transported in alternative configurations at GVWs above 80,000 pounds. The most likely configurations to be used throughout the NTN for this purpose are six axle semis and five and nine axle twin 28 foot trailers. Twin 28s with six, seven, or eight axles could also be used, but these configurations would have axle arrangements that may not be conducive to loading the trailers so as to take full advantage of the maximum GVW permitted. Seven axle semis could also be used; but, for an overall wheelbase of 57 feet or less, these vehicles would be allowed to carry only about five thousand pounds more than a six axle semi, an increase which is probably not sufficient to warrant their use. Removal of the GVW limit would also allow some increased use of LCVs for loads passing through, originating, or

terminating in States that allow LCVs, but that have 80,000 pound GVW limits on the Interstate system.

At 43 feet between axles 2 and 6 and 12,000 pounds on the steering axle, Bridge Formula B allows 87,000 pounds on a six axle 48 foot semi. The corresponding limit when 42 foot trailers are used (a common length for tanks and hoppers) is only 82,900 pounds. Accordingly, we assume that nearly all six axle semis would use 48 foot trailers.

With similar assumptions about axle spacing, Bridge Formula B limits for five and nine axle twin 28s are 91,500 and 110,000 pounds, respectively, with higher limits applying to longer nine axle rigs up to 133,000 pounds (with uneven axle loadings) for double 48s where they are allowed. Our analysis is based on an estimate that about half the operations in western States that currently use seven or eight axle doubles would eventually be converted to nine axle doubles in order to take advantage of the higher weight limits that would become possible if current GVW limits were removed. We have not assumed a similar shift from six axle to nine axle doubles, although our data on VMT by State and axle configuration suggest that some shift could occur in States that currently have a 105,500 pound GVW limit.

Exhibit 4 compares estimates of the total cost of operating a five axle semi under the existing 80,000 pound GVW limit with corresponding estimates of the cost of operating the three most likely alternative configurations with 53,200 pound loads and fully loaded under the higher Bridge Formula B limits. All cost estimates are for truckload carriage in dry vans of dense commodities that allow the vehicles to attain the loaded weights shown in the exhibit.

The highest loaded weights shown in Exhibit 4 for each configuration assume typical axle spacing and 12,000 pounds on the steering axle. The fraction of miles operated empty by a five axle

EXHIBIT 4

POLICY OPTION 2: BRIDGE FORMULA B REPLACES THE 80,000 POUND GVW LIMIT

ESTIMATES OF TOTAL COST FOR TRANSPORTING DENSE COMMODITIES IN ALTERNATIVE CONFIGURATIONS BY FOR-HIRE TRUCKLOAD CARRIERS OF GENERAL COMMODITIES

Configuration	Loaded Weights (lbs.)	Cost per Mile	Cost per Loaded Mile	Tare Weight (lbs.)	Load (lbs.)	Cents per Ton-Mile	Comparison with 5 Axle Semi
5 Axle 48'	80,000	1.08	1.25	26,800	53,200	4.69	
6 Axle 48'	81,500	1.10	1.27	28,300	53,200	4.77	1.85%
	87,000	1.11	1.29	28,300	58,700	4.38	-6.43%
5 Axle Twin 28'	83,200	1.12	1.30	30,000	53,200	4.87	3.95%
	91,500	1.14	1.32	30,000	61,500	4.30	-8.27%
9 Axle Twin 28'	90,900	1.20	1.39	37,700	53,200	5.22	11.41%
	110,000	1.25	1.44	37,700	72,300	3.99	-14.85%

semi is taken to be 0.15, a typical figure for intercity truckload carriers of general freight (though some very efficient carriers are able to achieve an empty mileage fraction as low as 0.05).

Similar estimates have been developed for LTL carriage and for truckload carriage in refrigerated, flatbed, tank, hopper, and dump trailers. These vehicles generally have higher costs per ton-mile, largely because their fraction of empty mileage is higher. However, for each type of trailer, the larger configurations offer percentage cost savings that are similar to the savings shown in the last column of Exhibit 4.

The last column of Exhibit 4 indicates that, if the alternative configurations can achieve the same utilization as five axle semis, they are moderately less expensive than five axle semis for carrying heavy loads. Of these three configurations, nine axle twins provide the greatest saving (nearly 15 percent), while the savings produced by the other configurations are only about half as large.

Six axle semis can be used to carry any shipment carried by five axle semis, and the two alternative doubles configurations can carry nearly all such shipments but are limited in several States in the number of origins and destinations that they can serve. Thus, the same fraction of empty miles should be attainable with six axle semis, though a slightly higher fraction could result for the twin configurations.

The alternative configurations, however, are somewhat less efficient than five axle semis for carrying freight that does not require the higher weight capacity of these configurations. The actual cost advantage of the alternative configurations in any particular operation will depend on the relationship between the number of loaded miles operated at GVWs above 80,000 pounds (for which these configurations have a cost advantage) and the number of loaded miles operated at lower GVWs (for which these

configurations, and nine axle twins in particular, have a cost disadvantage).

The shift from semis to five and nine axle doubles will be affected by State length limits and by the access restrictions placed on twin trailers in many, mostly eastern, States. For the purpose of our analysis, we have concluded that there would be almost no increased use of twins in New England, and that increased use of twins in the Middle Atlantic and South Atlantic Regions would be only about half of what it would be in the absence of access restrictions.

Commodities Affected and Effects on Carriers

The shift away from five axle semis will vary with commodity and operational characteristics. For commodities carried in hoppers or dry bulk tankers, the preferred configuration will nearly always be a nine axle double, with six axle semis usually used where access restrictions limit the use of twins.

For most liquid bulk commodities, the preferred configuration frequently also will be a nine axle double. The use of doubles for carrying chemicals, however, will be limited both because many receivers of chemical shipments want only a limited volume in any one delivery and because the use of twin 28s would increase tank cleaning costs. Some reticence to use twin 28 foot trailers was also exhibited by an oil company representative because of concerns about stability, though longer doubles are commonly used to carry crude where they are allowed. A more common shift would be to truck-trailer combinations, which are widely used in the West for petroleum products. Due to the high cost of tank trailers, the phase-in period for new equipment will be appreciably longer than for other trailer types.

For movements now made using dump trailers, some use of seven axle truck-trailer combinations would seem likely. However, because of practical limits on trailer length, there would be no advantage to adding axles to single dump trailer rigs. Some shift from single unit dump trailers to truck-trailer combinations could also occur.

Flatbed operators are expected to shift to nine axle doubles for much of their operations where access restrictions do not inhibit the use of twins, while using six axle semis (a common existing configuration) for loads that require longer trailers and also for access to locations where twins are not allowed.

Because of their higher cost of operation, nine axle twin 28s would appear to be of limited interest to operators of dry vans. However, both six axle semis and five axle twins offer some advantages for weight-limited carriage, and five axle twins also offer advantages (relative to 48 foot vans) for most cube-limited hauls of over 200 miles. Lifting the 80,000 pound GVW limit would enable existing operators of twin vans to improve equipment utilization by competing effectively in both weight-limited and cube-limited markets, particularly in areas that do not restrict the use of twin 28s but do restrict the use of 53 foot trailers. Accordingly, we estimate that eliminating the GVW limits would result in an appreciable shift from five axle 48 foot vans to five axle twins and a small shift to six axle vans.

The extra cost of refrigerating a second trailer limits the attractiveness of twin 28s for operators of refrigerated vans. Accordingly, we believe that nearly all of these operations will be converted to the use of six axle semis, except where longer combinations are allowed. Since most reefers do carry some cube-limited loads (primarily on backhauls), the savings resulting from this switch would be somewhat less than they would be for more purely weight-limited operations.

Finally, LTL operators are expected to respond to Policy Option 2(b) by switching from twin 28s to triples in North Dakota, where triples are currently legal but restricted to 80,000 pounds on the Interstate System, and by making greater use of triples in Oklahoma.

Effects on Shippers

Although shippers undoubtedly would welcome any decrease in transport costs, a 5 to 15 percent decline in these costs would have a perceptible effect on product prices only in the case of low value products for which transport costs represent an appreciable portion of the delivered price of the product. Among the products carried in the equipment identified above, transport costs represent a fairly appreciable portion of the delivered price of agriculture products, a few low value chemicals, and some petroleum and mineral products.

National Impacts

Exhibit 5 presents estimates of the steady-state annual effects, exclusive of the modal-diversion effects, of a variant of Policy Option 2(b) in which the higher weight limits are applied to the entire highway system. Estimates of Policy Option 2(b) are now being developed along with the corresponding modal diversion effects. Because Policy Option 2(b) does not apply to all highways, its effects will be somewhat smaller than those shown in Exhibit 5.

The policy option whose effects are summarized in Exhibit 5 could be expected to result in eventually diverting approximately 560 billion payload ton-miles of traffic from five axle semis to larger combinations. This shift in traffic is anticipated to cause annual VMT of five axle semis to fall by 36.4 billion (42 percent of forecast VMT), and VMT of all larger combinations to increase by 32.3 billion (more than quadrupling the forecast VMT of all such

EXHIBIT 5

ESTIMATES OF ANNUAL IMPACTS OF POLICY OPTION 2(b):
ELIMINATION OF 80,000 POUND GVW LIMIT ON A NATIONAL TRUCK NETWORK

	Change	Percent of Base Case
Truck Vehicle Miles of Travel (10^9)		
Overall	-0.7	-0.5%
Non-local 5 Axle Semis	-5.6	-14.0%[1]
Truck Payload Ton-Miles (10^9)		
Overall	+10	+1.1%
Diverted from Non-local 5 Axle Semis	56	12.0%
Diverted from Rail	11	1.2%
Truck Freight Expenditures (10^9)		
Change in Vehicle Utilization	-$0.4	-0.1%
Modal Diversion	+ 1.1	+0.3%
Subtotal	+$0.7	+0.2%
Rail Freight Expenditures (10^9)		
Modal Diversion	-$0.5	-1.9%
Rate Changes	- 0.2	-0.7%
Subtotal	-$0.7	-2.6%
Total Freight Expenditures (10^9)	-----	-----

[1]Represents percent of non-local use of all TSTs.

combinations). Six axle semis are expected to account for about half of the increased VMT in larger combinations, while nine axle and five axle doubles are expected to contribute most of the remaining increase. An overall VMT reduction of 4.1 billion is anticipated -- about 3.7 percent of total VMT of combination trucks.

The reduction in VMT is estimated to result in an annual $1.9 billion saving in transport costs for existing truck traffic. This represents about 1.7 percent of transport costs for all shipments made in combination trucks. The savings, however, would not be distributed uniformly over all transport in combination trucks. We estimate that the average reduction in transport costs for shipments carried by vehicles benefiting from the higher weight limits would be about 4.2 percent.

Policy Option 2(a): Elimination of 80,000 Pound GVW Limit on the Interstate System

Policy Option 2(a) consists of replacing the current 80,000 pound GVW limit with Bridge Formula B on the Interstate system and on a set of roads providing access to facilities that are within a few miles of an IS entrance or exit. As described in the preceding section, several States currently allow GVWs to exceed 80,000 pounds on non-IS roads. We assume that length limits would not be extended and that no staging areas would be built. Hence, we assume that there would be no significant new use of over 80,000 pound doubles for truckload shipments between pairs of locations that would not be directly served by roads on which the higher limits would apply.

Under Policy Option 2(a), LTL carriers could be expected to expand their use of triples in some corridors in the same way as under Policy Option 2(b). We assume that the Policy 2(a) access provisions would permit access to all LTL terminals in those states that would be likely to be involved in the operation of triples.

Policy Option 2(a), however, would provide substantially fewer opportunities for truckload carriers to take advantage of the higher weight limits. Private carriers operating specialized equipment between a set of origins and destinations that are all located on designated access roads or on roads that already have high GVW limits would be expected to switch to heavier configurations to serve these routes. Most private carriage of chemicals would probably be able to be moved in these heavier configurations, as would some agricultural products (particularly in California, where higher GVW limits can already be used on some local roads but not on the Interstate system or other State highways). Petroleum companies would probably also be able to use these configurations for transport to many bulk plants and perhaps to retailers located near Interstate system interchanges. However, the inefficiency of using the heavier configurations on routes where an 80,000 pound limit applies would require petroleum companies to continue to operate existing trailers for deliveries to the many locations located on 80,000 pound roads. Few mines are located on roads that would have their GVW limits raised under Policy Option 2(a).

The opportunities for for-hire truckload carriers would be even more limited. The heavier configurations have a cost advantage over lighter configurations only when they can be used primarily for hauling loads at GVWs above 80,000 pounds. For-hire carriers would find it advantageous to obtain heavier equipment to replace many existing trailers used for hauling chemicals, but very few other trailers.

Chemicals hauled in five axle semis account for about four percent of all freight ton-miles transported by semis. Under Policy Option 2(a), perhaps half of this traffic would eventually be diverted to one of the heavier configurations (six axle semis or nine axle doubles), and a small amount of other truckload traffic would be similarly diverted. We estimate that

approximately four percent of existing non-local semi traffic would eventually be diverted to the heavier combinations. Preliminary indications are that the effects of Policy Option 2(a) would be about one fifth of those produced by Policy Option 2(b).

Policy Option 3(b): Requirements for Special Equipment on Doubles Operating above 80,000 Pounds

Policy Option 3(b) consists of replacing the current 80,000 pound GVW cap with Bridge Formula B on the National Truck Network but applying additional requirements on doubles operating on the Interstate system at GVWs above 80,000 pounds. These would consist of a minimum axle requirement (to limit pavement damage) and a dolly or hitching restriction (to reduce rollover potential). These requirements would increase fixed and operating costs and they would also increase tare weight, and so reduce maximum payload. To make these vehicles more attractive economically, it is possible that they would be allowed to use 34 foot trailers (Policy Option 3(b)2) instead of the 28 foot trailers that are the maximum length currently allowed on doubles on most roads in the eastern and central parts of the country.

Vehicle Configurations, Payloads and Transportation Costs

Exhibit 6 shows estimates of the total cost of operating several configurations that might be operated under Policy Option 3(b). The estimates were developed in the same way as those presented previously. All cost estimates are for truckload carriage of dense commodities that permit the vehicles to attain the maximum loaded weights shown in the exhibit. The highest loaded weights shown for each configuration are estimates of the theoretical maximum under Bridge Formula B with typical axle spacing and 12,000 pounds on the steering axle. The costs shown for nine axle twin 28s are slightly higher than those shown in Exhibit 4 because of the increased weight and costs resulting from the dolly or hitching restriction. The costs per ton-mile shown

EXHIBIT 6

POLICY OPTION 3: SPECIAL EQUIPMENT REQUIRED ON DOUBLES OPERATING OVER 80,000 POUNDS GVW

ESTIMATES OF TOTAL COST FOR TRANSPORTING DENSE COMMODITIES IN ALTERNATIVE CONFIGURATIONS BY FOR-HIRE TRUCKLOAD CARRIERS OF GENERAL COMMODITIES

Configuration	Loaded Weights (lbs.)	Cost per Mile	Cost per Loaded Mile	Tare Weight (lbs.)	Load (lbs.)	Cents per Ton-Mile	Comparison with 5-Axle TST
5 Axle 48'	80,000	$1.08	$1.25	26,800	53,200	4.69	
6 Axle 48'	81,500	$1.10	$1.27	28,300	53,200	4.77	1.85%
	87,000	$1.10	$1.29	28,300	58,700	4.38	-6.43%
5 Axle Twin 28'	83,200	$1.12	$1.30	30,000	53,200	4.87	3.95%
	91,500	$1.14	$1.32	30,000	61,500	4.30	-8.27%
7 Axle 28' B/C	89,000	$1.18	$1.37	35,800	53,200	5.14	9.73%
	99,500	$1.21	$1.40	35,800	63,700	4.40	-6.19%
9 Axle Twin 28' B/C	92,000	$1.22	$1.41	38,800	53,200	5.31	13.37%
	110,000	$1.27	$1.46	38,800	71,200	4.11	-12.26%
7 Axle Twin 34' B/C	91,000	$1.19	$1.39	37,800	53,200	5.21	11.13%
	107,000	$1.25	$1.44	37,800	69,200	4.15	-11.43%
9 Axle Twin 34' B/C	94,000	$1.23	$1.43	40,800	53,200	5.38	14.78%
	117,000	$1.29	$1.49	40,800	76,200	3.91	-16.55%

assume that the fraction of miles operated empty is the same (0.15) for all configurations. The costs per ton-mile vary appreciably with the fraction of miles empty, but, for alternative configurations, the relationship between costs does not change as long as both configurations have the same empty load factor.

The cost estimates in Exhibit 6 indicate that seven axle twin 28s are about two percent more costly than five axle twin 28s (from Exhibit 4) when both configurations are loaded to the GVW limit and about four percent more costly when both configurations are carrying a 53,200 pound payload. A comparison of the costs of operating seven axle twin 28s with those for five and six axle semis suggests that there are few truck operations, if any, for which seven axle twin 28s would be the preferred configuration.

Because B train and C train configurations weigh more than A trains, nine axle twin 28s that could be operated under Policy Option 3(b) (see Exhibit 6) are slightly less economical than those that could be operated under Policy Option 2 (in Exhibit 4). Nonetheless, when consistently used to carry weight-limited commodities, the nine axle twin 28s shown in Exhibit 6 are about 12 percent less expensive per ton-mile than five axle semis. Accordingly, if Policy Option 3(b) is implemented with no change in length limits, we expect that use of nine axle doubles will be very similar to the use of these vehicles under Option 2(b).

If Policy Option 3(b) is implemented in conjunction with a regulation allowing the use of 34 foot doubles on the NTN, nine axle twin 34s would offer even greater savings. If this configuration can be consistently loaded to maximum weight, it can result in reducing transport costs by nearly 17 percent.

The advantage of twin 34s over existing configurations is not limited to their higher weight-carrying ability. The cubic capacity of twin 34s is about 21 percent greater than that of twin 28s and 42 percent greater than that of 48 foot semitrailers.

Seven axle twin 34s would thus appear to be attractive for cube-limited shipments that can be effectively handled in twin trailer configurations. Thus, if Policy Option 3(b) is implemented in conjunction with a regulation allowing 34 foot doubles on the NTN, it is likely that seven axle twin 34s would become widely used by general freight carriers as well as by specialized freight carriers.

Effects on Carriers and Commodities

The effects of implementing Option 3(b) on carriers and commodities will depend upon the cost of the hitching restriction, any practical limitations it might have on loading and unloading operations, and whether or not the allowable trailer length for doubles is increased.

If no change is made in allowable trailer lengths, nearly all operators of dry vans would continue to use their existing equipment, while operators of other trailer types would respond in the same way as under Option 2(b). The net cost savings would be somewhat lower than under Option 2(b) because of the slightly higher cost of operating nine axle twins and the lack of benefits to operators of dry vans.

If, however, twin 34s are allowed on the NTN, it is likely that there would be widespread introduction of seven axle twin 34s by private and for-hire carriers that had primarily cube-limited or weight-limited shipments between locations served by the NTN. The cost of truckload transport would decline for nearly all movements between such locations, except shipments for which other considerations, such as storage capacity, limit increases in shipment size.

Policy Option 4(b): Combined Policies

Policy Option 4(b) consists of a combination of Policy Options 1 and 3(b). Under this option:

- All vehicles operating on the Interstate system would have to adhere to the Federal limits of 20,000 and 34,000 pounds for single and tandem axles, respectively, and the maximum weight on tridem axles and all sets of consecutive axles would be governed by Bridge Formula B
- The only GVW limit on the Interstate system and the rest of the National Truck Network would be that imposed by Bridge Formula B
- The Policy Option 3(b) equipment requirements would apply to all doubles operating on the Interstate system with GVWs over 80,000 pounds

The primary economic effects of Policy Option 4(b) on the private sector consist of a combination of the Option 3(b) benefits to users of combination trucks with the increased costs to users of single unit trucks under Option 1. Preliminary indications are that the benefits to users of combination trucks will be of the same order of magnitude as the costs to users of single unit trucks.