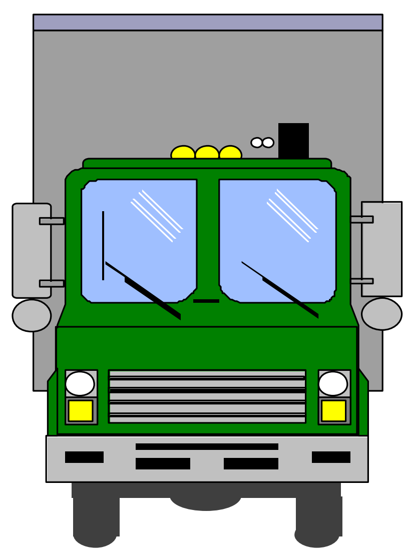
CHAPTER II



Analytical Framework

Introduction

The truck size and weight (TS&W) analytical framework provides a structure for assessing the impacts of alternative truck configurations and policy options. Data and analytical tools have been developed to evaluate critical impact areas such as safety, pavement wear, bridge stress, and rail competitiveness. The framework is a flexible tool useful in examining a wide range of TS&W options, from more restrictive to more liberal.

As indicated in Chapter I, the data and methodologies underlying the framework will be periodically updated, allowing the Department of Transportation (DOT) to respond to TS&W proposals without embarking on a new study for each request.

Figure II-2 provides an overview of the analytical framework. The structure reflects input from the extensive outreach process underlying the study and from the DOT's internal coordination process. The participatory and oversight features of the study are described in Chapter I.

Supporting the analytical process is an objective technical foundation. The analytical framework includes state-of-the-art models and/or procedures designed to evaluate alternative TS&W policy scenarios.

Five illustrative TS&W scenarios are analyzed in this study. Scenarios were selected to illustrate potential impacts of a broad range of TS&W options involving both more liberal and more restrictive limits. The scenarios are discussed with respect to (1) the policy and technical considerations they address, (2) the truck configurations they include, (3) the highway networks on which the configurations are assumed to operate, and (4) other key assumptions.

This chapter provides an overview of the analytical process. Subsequent chapters discuss potential impacts of TS&W policy options, the analytical methods used to assess those impacts, and findings for each scenario.

Technical Foundation

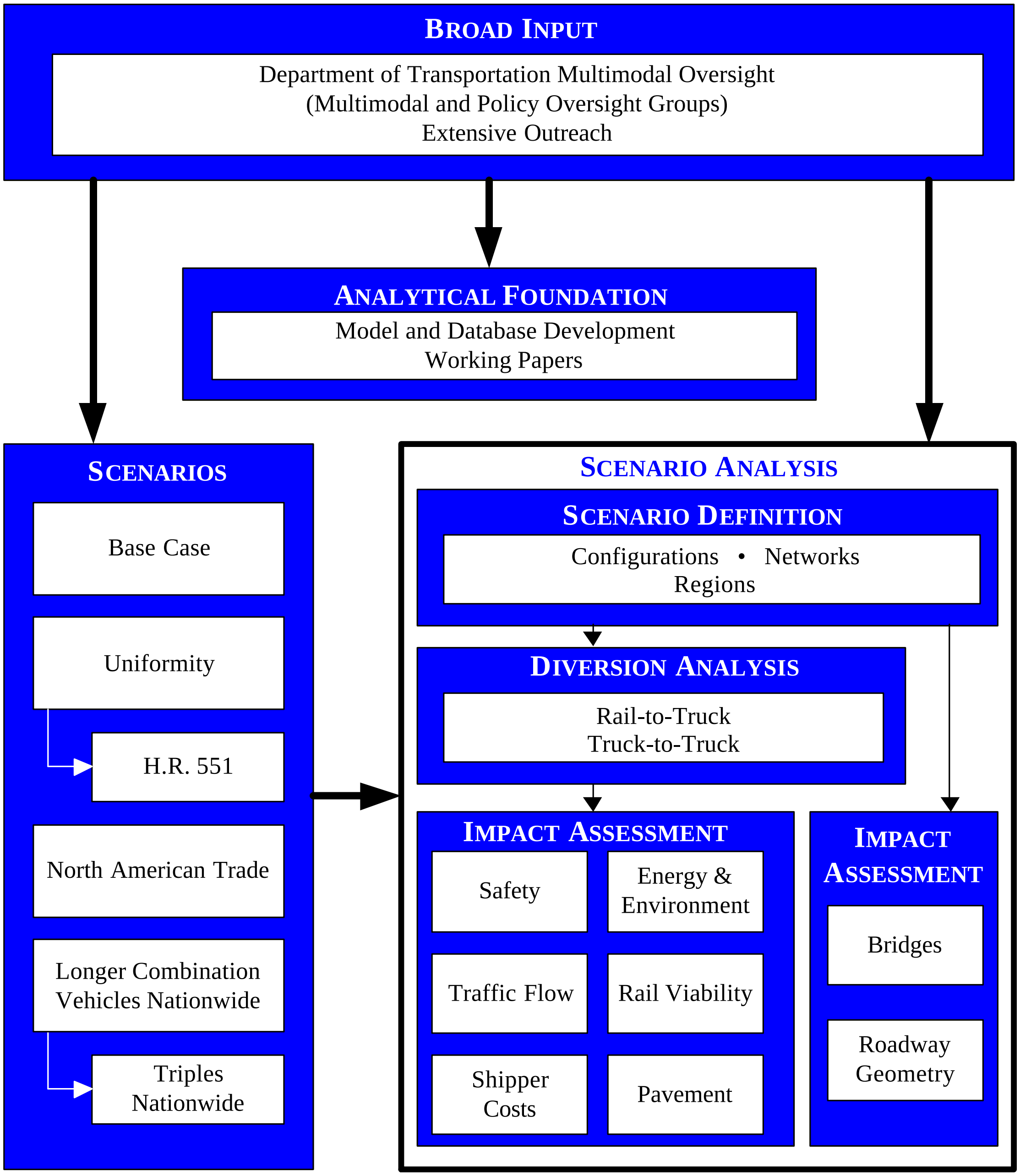
The analytical component of the study was developed along four distinct tracks. The first focused on developing background papers on current issues and trends related to freight markets and motor carriers. Figure II-1 shows issues investigated in thirteen working papers commissioned for the study. The papers describe the state-of-the-knowledge in critical areas as they relate to TS&W discussions.

The second track involved work to support development and calibration of the analytical tools. Activities included developing databases to describe truck weights, body types, commodities and truck flows; conducting commodity case studies covering the transportation of coal, farm products,

Figure II-1. Working Paper Topics

- Safety
- Pavement
- Bridges
- Roadway Geometry
- Traffic Operations
- Truck Costs
- Logistics
- Truck Travel and Mode Share
- Enforcement
- Environment
- Energy Conservation
- State Regulations

Figure II-2. Analytical Framework Overview



petroleum, and forest products; and carrier studies covering less-than-truckload, truckload and intermodal operations. The study also included corridor studies of Los Angeles to Chicago, Los Angeles to Houston, Minneapolis to New Orleans, Detroit to Tampa, New York to Atlanta, Seattle to Chicago, and Fargo to Laredo.

The third track incorporated findings from the first two tracks to develop analytical tools designed to assess the broad range of potential TS&W impacts. These tools include a vehicle stability and control database and a performance analyzer; long- and short-haul freight diversion models and a companion load-shift model; and pavement, bridge, rail industry, highway geometry and traffic operations impact analysis models.

The fourth track brings together the products resulting from the earlier work to evaluate alternative illustrative TS&W policy scenarios. This analytical approach may be used to evaluate regional TS&W policy options and impacts of TS&W scenarios for shipments of specific commodities.

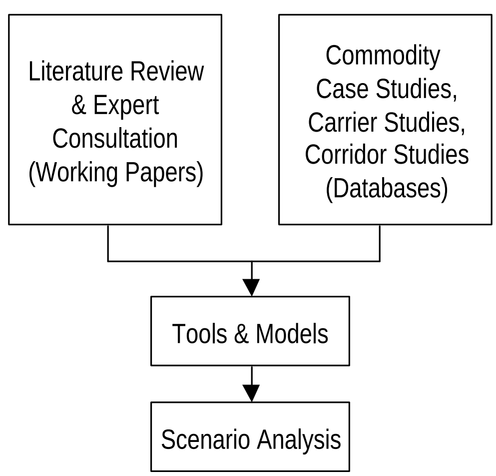
Illustrative Scenario Development

Scenario "building blocks" were identified in a Federal Register Notice published on April 25, 1996. The building blocks consist of configuration, highway network and geographic options that could be used to define alternative policy scenarios. A wide range of truck configurations was evaluated to assess the consequences of maintaining current TS&W limits as well as potentially restricting or expanding those limits.

It should be noted that although an infinite number of scenarios could theoretically be evaluated, time and budget constraints dictated that a limited set of scenarios be analyzed for this report. However, the Department is able to analyze other scenarios using the tools developed for this study.

The gross vehicle weights (GVW) and networks assumed to be available for certain configurations in the illustrative scenarios were chosen for analytical purposes only. They do not reflect weights or networks that the Department believes are necessarily

Figure II-3. Truck Size and Weight Analytical Process



appropriate.

A number of simplifying assumptions limit the ability to extend the theoretical scenario findings to actual "real world" impacts. For example, this study does not evaluate how impacts might vary if States and the Federal Government changed user fees to reflect changes in infrastructure and other costs associated with TS&W policy options. In practice it would be appropriate for States and the Federal Government to consider changing their user fees, but there was no basis for assumptions about the extent to which user fees might change and the types of changes that might be made.

Another set of simplifying assumptions concerned operating restrictions that might be placed on certain vehicle configurations. Most States that currently allow LCVs require those vehicles to operate under revokable permits that restrict when, where, and under what conditions they may operate. No such restrictions were explicitly assumed in the diversion analysis, except that LCVs would be limited to operating on certain defined networks. In practice some States might place restrictions on LCV operations such as allowing operations only during daylight hours or only during dry conditions. To the extent that such restrictions would limit the use of LCVs, the analysis may overestimate somewhat the potential use of LCVs.

Configurations

Only commercial trucks are considered in this study. These vehicles are either single-unit trucks (SUTs) whose cargo-carrying units are mounted on the same chassis as the engine, or are combination vehicles that have separate cargo-carrying trailers pulled by a truck or a truck-tractor.

The study scenarios include a broad range of commercial truck configurations: three- and four-axle SUTs; five- and six-axle semitrailers; double trailer combinations; and triple-trailers. These are illustrated in Figure II-4.

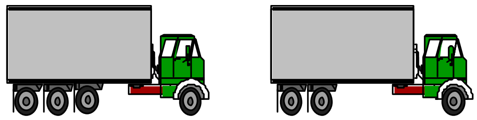
The configurations are analyzed at operating weights based on assumptions about axle weight and bridge overstress criteria.

It should be noted that a large set of truck configurations, some of which are not specifically addressed in the study scenarios were considered in developing the vehicle stability and control, vehicle offtracking, and roadway geometry impact databases. These databases have the flexibility to accommodate a broad range of policy options and will be useful in evaluating policy scenarios well beyond the five selected for initial analysis.

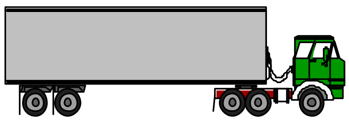
The nomenclature describing the vehicles in Figure II-4 provides a useful shorthand for referring to the study configurations. The first number in the series indicates the number of axles on the power unit; the next set (alphanumeric), refers to the number of axles supporting the trailing unit

Figure II-4. Illustrative Vehicle Configurations

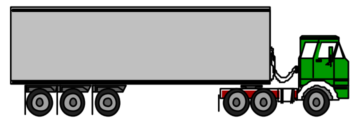
Single Unit Trucks



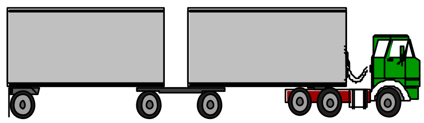
Conventional Combination Vehicles



5-Axle Tractor Semi-Trailer

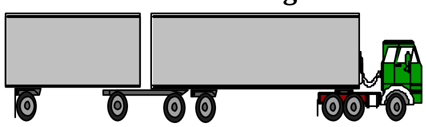


6Axle Tractor Semi-Trailer

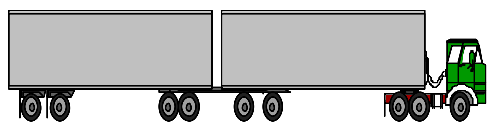


STAA or “Western” Double

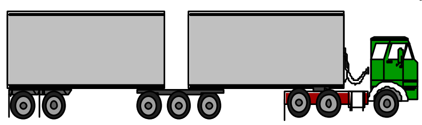
Longer Combination Vehicles (LCVs)



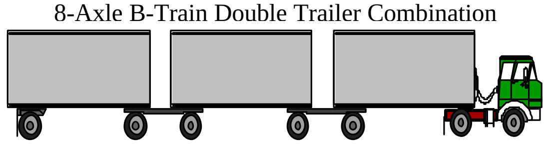
Rocky Mountain Double



Turnpike Double



8-Axle B-Train Double Trailer Combination



Triple Trailer Combination

(a semitrailer or trailer). If the unit is a semitrailer, the number indicating the number of axles is preceded by an "S." Subsequent numbers indicate the number of axles associated with the remaining trailing units.

The Appendix provides a "cross walk" between the *Highway Cost Allocation (HCA) Study* vehicles and the *Comprehensive TS&W (CTS&W) Study* configurations.

Networks and Geographic Units

The configurations are evaluated in relation to various highway systems—the National Network (NN) for STAA vehicles, the National Highway System (NHS), and two limited systems of highways tailored for the operation of LCVs. The LCV networks were developed to meet the analytical requirements of the study. For purposes of this analysis, all configurations are assumed to operate nationwide. Analytical networks were required for the study to reflect the fact that some vehicle configurations have physical and operating characteristics that would make them unsuitable to operate on all highway systems.

County-to-county mileage tables were created for three different networks: the NN and two hypothetical LCV networks. All networks used the "National Transportation Atlas Data Base: 1995" from the DOT's Bureau of Transportation Statistics.

The use of specific roadway networks allows proposed changes to the TS&W limits to be measured on specific highway functional classes within each State.

For each network, the mileage to and from each county population center was determined. For each origin-destination pair the following information was derived: (1) travel distance based on quickest travel time; (2) estimated travel time; (3) mileage on each highway functional class; (4) mileage in each State; and (5) non-network miles between origin/destination to the road network (i.e., drayage distance).

National Network for Large Trucks

The Surface Transportation Assistance Act (STAA) of 1982 required States to allow 48-foot semitrailers (or longer if grandfathered) and 28-foot double trailers (often referred to as "STAA vehicles") on specified highways. The Act directed the Secretary of Transportation to designate an NN for trucks that could accommodate vehicles with those trailer lengths. Today, with over 200,000 miles of roadway, the NN includes virtually all Interstate Highways (44,000 miles) as well as other highways. States are required to allow reasonable access for the STAA vehicles to and from the NN. Figure II-5 provides a map of the NN.

National Highway System

With the National Highway System Designation Act of 1995, Congress established the NHS. This system, which includes 156,986 miles, consists of the highways of greatest National interest, and includes the Interstate System, a large portion of the other principal arterial highways, and a small portion of mileage on the other functional systems. The NHS is depicted in Figure II-6.

Analytical Networks for Longer Combination Vehicles

Two networks were developed for the study to evaluate the impact of expanding LCV operations. These networks are not proposed or endorsed by the Department as LCV networks. They are for analytical purposes only.

The network developed to test the operation of long double trailer combinations, Rocky Mountain Doubles (RMDs) and Turnpike Doubles (TPDs), consists of 42,500 miles and provides for continuous east to west travel.

This network consists of access-controlled, inter-connecting segments of the Interstate system and other highways of comparable design and traffic capacity. The routes connect major markets and distribution centers.

The network designed to evaluate the impact of allowing triple-trailer combination vehicles to operate nationwide includes 65,000 miles of rural Interstate and other highways. Some urban Interstate highway segments are included for connectivity. This network includes many low traffic highways in the West and some four lane highways in the East. The network designed for the operation of triple-trailer combinations is larger than the network used to analyze long double combination operations because triple-trailer combination vehicles have more articulation points than RMDs and TPDs, and therefore fewer problems with offtracking.

Both networks likely are more extensive in some States than would be politically or practically feasible and thus tend to overestimate the impact of TS&W policy options addressing LCVs. Relatively extensive networks were analyzed in this study to estimate the upper end of likely impacts that might occur under each TS&W scenario. If less extensive networks were available, impacts would be smaller. Time and resource constraints did not allow sensitivity analyses to be conducted to evaluate different networks. The analytical networks for LCVs are shown in Figures II-7 and II-8.

Scenario Definitions

Three illustrative scenarios were identified for initial evaluation: (1) “Uniformity”, (2) “North American Trade”, and (3) “LCVs Nationwide”. A “Base Case” Scenario was evaluated for comparison.

Also analyzed are two scenarios that have been identified by Congress and other interested parties as of particular interest: (1) enactment of H.R. 551, “The Safe Highways and Infrastructure Protection Act of 1997” and (2) Nationwide operation of triple-trailer combinations. Assumptions in this latter scenario are not identical to those that might have been specified by proponents of that scenario, but are consistent with assumptions about triple-trailer operations in the Nationwide LCV scenario. Having consistent assumptions allows differences between the two scenarios to be readily compared.

The DOT anticipates that, over time, additional policy options will be advanced for analysis. The analytical

Figure II-5. National Network for STAA Vehicles

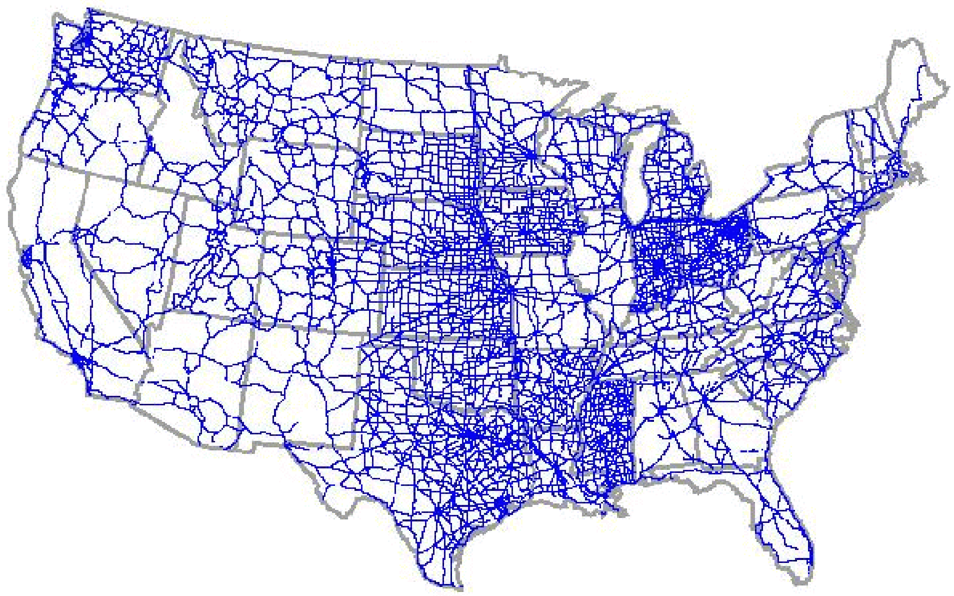


Figure II-6. National Highway System Map

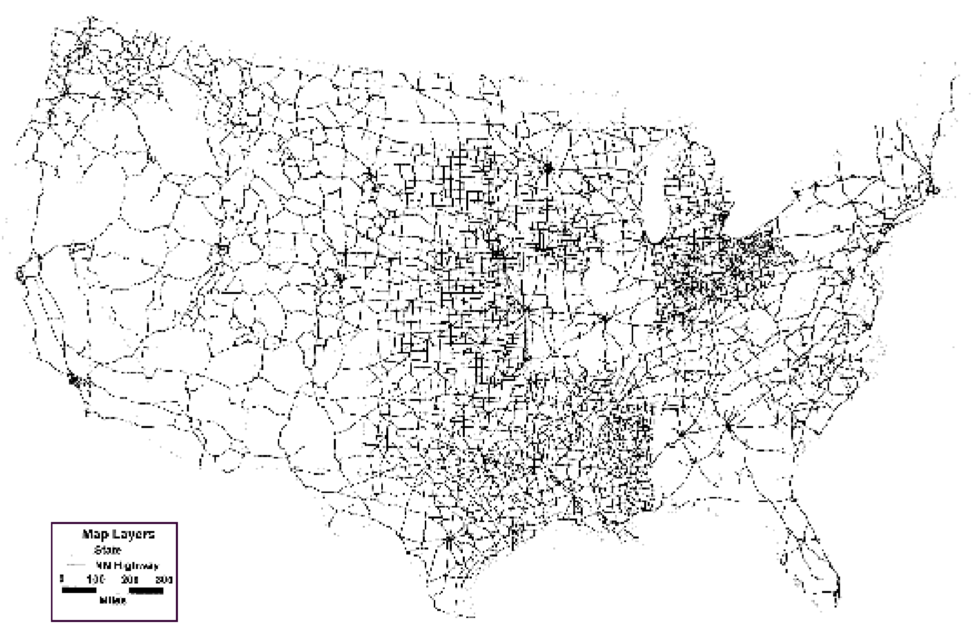
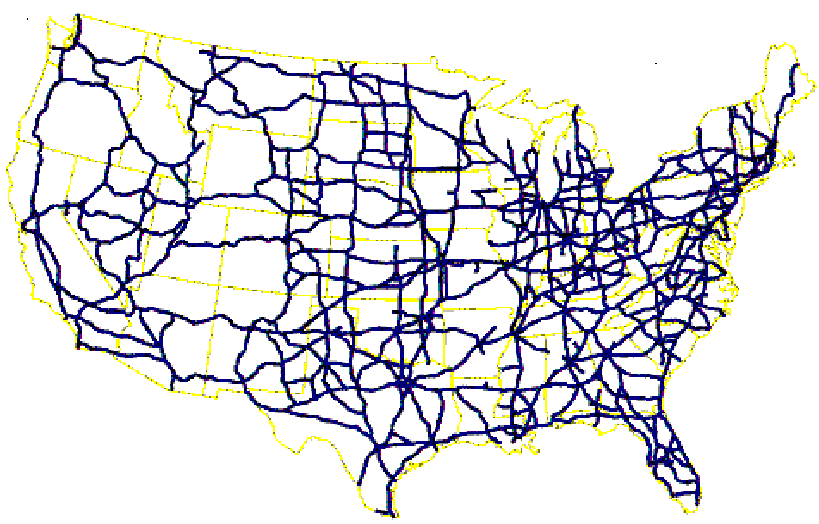


Figure II-7. **Analytical Network for Long Double-Trailer Combinations**

Figure II-8. **Analytical Network for Triple-Trailer Combinations**



framework developed for the study is sufficiently flexible to permit the evaluation of many different options, particularly those that are variations on the study's core illustrative scenarios.

These scenarios are described briefly below, and in detail, in Chapter III.

Base Case

The Base Case serves as a base line for the other scenarios and retains all features of current law. Figure II-9 shows key provisions of the base case. The base case includes the freeze on LCVs imposed by the Intermodal Surface Transportation Efficiency Act (ISTEA) which restricts the use of LCVs to the types of operations in effect as of June 1, 1991. The freeze was continued by the Transportation Equity Act for the 21st Century (TEA-21). The definition of an LCV, in that legislation and adopted for this study, is any combination of a truck tractor and two or more trailers or semitrailers which operates on the Interstate System at a GVW greater than 80,000 pounds. It should be noted that there are two distinct freezes in the ISTEA, one on the weight of LCVs on the Interstate System and the other a freeze on the length of the cargo- carrying units of combinations with two or more such units on the NN. Current Federal weight limits would remain on Interstate highways, as would existing grandfather rights. It should be noted that the Base Case assumptions may be somewhat conservative in the long run since States can change their TS&W limits on non-NN (or non-Interstate) highways. The Base Case also assumes that no change in technology, operating practices or pricing will take place between the base year (1994) and the analysis year (2000).

Uniformity Scenario

Figure II-9. Base Case Federal Truck Size and Weight Limits

Federal law regulates trucks by specifying basic truck size & weight standards and exempting certain situations from those standards by recognizing State grandfather rights and special permits. Current Federal law sets the following limits:

- 20,000 pounds for single axles on the Interstate;
- 34,000 pounds for tandem axles on the Interstate;
- Application of Federal Bridge Formula for other axle groups up to the maximum of 80,000 pounds gross vehicle weight on the Interstate;
- 102 inches for vehicle width on the National Network (NN) for large trucks;
- 48-foot (minimum) or longer, if grandfathered, for semitrailers in a semitrailer combination on the NN; and
- 28-foot (minimum) for trailers in a twin-trailer combination on the NN.

The Uniformity Scenario would eliminate current grandfather provisions that now allow some States to retain higher GVW and axle weight limits than the Federal limits on the Interstate System. The grandfather provisions are based on a State's weight limits that existed in 1956. This scenario would also extend Federal limits to the entire NN, resulting in nationally uniform weight limits on the NN.

North American Trade Scenario

The North American Trade Scenario focuses on changes that could enhance trade among the North American trading partners and other international trading partners as well. It assumes gross vehicle weights more comparable to those in Canada and Mexico. Key vehicles under this scenario are the six-axle tractor-semitrailer and an eight-axle "B-train" double. The "B-train", which is used in Canada and in the U.S. along the Canadian border, has a coupling mechanism between the first and second trailers with a single articulation point rather than two like conventional twin-trailer combinations. This gives the combination substantially greater stability than conventional twin trailer combinations. Both the six-axle tractor-semitrailer and the B-train double have tridem axles (see Figure II-10 for AASHTO's definition of a tridem axle). Currently, the weight allowed on a three-axle group is limited by the Federal Bridge Formula to weights below those allowed in Canada and Mexico. Two tridem-axle weights are evaluated in this scenario, 44,000 pounds and 51,000 pounds. The 51,000 pound tridem would allow gross vehicle weights of 97,000 pounds for six-axle tractor-semitrailers which is sufficient to allow 40-foot containers to be carried at the maximum international weight limits.

Because a tridem-axle weight limit of 51,000 pounds would have adverse infrastructure and safety impacts, a 44,000-pound tridem-axle weight limit was also analyzed. This weight limit would provide some, although reduced, benefits for international trade, but would limit potentially negative vehicle stability, control, and infrastructure impacts. Under these limits, a six-axle tractor semitrailer combination could operate at 90,000 pounds and the B-train double at 124,000 pounds. In addition, this scenario could increase productivity for short wheelbase straight trucks by allowing operations of four-axle vehicles at weights of either 64,000 pounds or 70,000 pounds.

Figure II-10. Tridem Axle Definition

Any three consecutive axles whose extreme centers are not more than 144 inches apart, and are individually attached to or articulated from, or both, a common attachment to the vehicle including a connecting mechanism designed to equalize the load between axles.

-The American Association of State Highway Transportation Officials

Longer Combination Vehicles Nationwide Scenario

The LCV Nationwide Scenario estimates the impact of expanding LCV operations to a nationwide network. Of particular concern with the potential expansion of LCV operations is the impact on safety, competitiveness of the rail industry, and productivity.

The 1991 ISTEA placed a freeze on LCV operations. The legislation allowed LCV operations that were legal under State law in effect on June 1, 1991 to continue, if the State so desired. TEA-21, passed in 1998, continued the ISTEA freeze. Currently, 20 States permit the operation of some type of LCV.

Figure II-11. Weigh-Out versus Cube-Out Freight

For high-density (weigh-out) freight such as farm products and natural resources, a vehicle's maximum payload is controlled by truck weight limits. For low-density (cube-out) freight, such as computer equipment and snack foods, vehicle size limits constrain payload.

H.R. 551 Scenario

H.R. 551 calls for a phase-out of trailers over 53 feet in length (new trailers over 53 feet would not be permitted and existing equipment would be grandfathered). H.R. 551 also would freeze weight limits on Interstate and NHS facilities, preventing incremental increases in TS&W limits by the States. The effects of this provision, however, cannot be fully modeled because the base case also assumes no increases in State TS&W limits. Therefore, for practical purposes, the H.R. 551 Scenario yields impact results which are almost identical to the Base Case Scenario. However, the provision to phase-out trailers over 53 feet is evaluated.

Triples Nationwide Scenario

The Triples Nationwide Scenario would permit triple-trailer combinations having three short (28- to 28.5-foot) trailers to operate at the same weights and on the same designated nationwide network as they are assumed to operate in the LCVs Nationwide Scenario. These weights are greater than weights at which triples typically operate today under existing grandfather weight limits. In some States that currently allow triples, the network is larger than the network of roads on which triples currently operate, and in some States the analytical network is smaller. Time and resource constraints did not permit evaluation of more than the one illustrative triples network.

Impact Areas

The effects of the alternative TS&W policies are presented in terms of each scenario's impact on various areas of interest:

- Freight Diversion
- Highway Agency Costs
  - Pavement Preservation
  - Bridge Protection
  - Roadway Geometry
- Safety
- Traffic Operations
- Environmental Quality and Energy Consumption
- Rail Industry Competitiveness
- Shipper Costs

Each impact area is briefly described below.

Freight Diversion

Truck size and weight limits determine the maximum payload that vehicles may carry. Figure II-11 explains the relationship between commodity density and maximum payload. In general, increases in TS&W limits will increase the tonnage and/or volume of freight that may be carried per vehicle per trip. Fewer trips would be required to carry the same amount of freight, thereby decreasing tractor vehicle-miles-of-travel (VMT) and reducing trucking costs. Alternatively, more restrictive TS&W limits would increase trips, tractor VMT, and trucking costs.

When the price of a good or service changes, demand may be affected. Comments to the docket suggested that rather than reducing truck VMT, previous increases in TS&W limits had increased VMT. A working paper was commissioned for this study to investigate the issue of "induced demand" and whether this would likely be a large or small impact. Based on relationships between total transportation costs and the relative changes that might be expected as the result of changes in TS&W limits, the paper concludes that any induced demand for trucking services because of the lower price would be small.

While the amount of new truck traffic that might be induced by changes in TS&W limits is expected to be relatively small, changes in truck costs and rates may cause a change in the selection of transport mode for some shipments that are not reflected in the induced demand analysis described above. For example, reductions in truck rates per unit of payload could induce some shippers to switch from rail to truck services. Further, changes in other shipper logistics costs impacted by TS&W variables (such as the size and frequency of shipments) may also influence intermodal (truck/rail) diversion. Examples of these costs include warehousing, order processing, and freight loss or damage.

The diversion analysis generates VMT by truck configuration and rail car miles for boxcars and intermodal traffic. This information is extremely important to the overall study because most impact assessment methods depend on estimates of VMT by truck configuration. Several state-of-the-art diversion models were developed for the study to predict the impact of TS&W changes on mode choice and truck configuration selection.

Highway Agency Costs

Pavement

Pavement wear (see Figure II-12) is of interest because deteriorated pavement increases user operating costs and necessitates public expenditures to correct pavement deficiencies. Pavement deterioration increases with axle weight and the number of axle loadings a pavement experiences, both of which may be affected by TS&W changes. The study relies on pavement deterioration models developed for the 1997 *HCA Study* to predict changes in pavement costs associated with the various TS&W scenarios.

Bridge

While the relationship between pavement deterioration and axle or axle group weight is well documented, the role of trucks with respect to bridge wear is not as well understood. Bridge engineers base new bridge designs on expected typical truck loading and include safety margins to ensure against failure. These margins are significant and reflect uncertainty about bridge materials, construction practices, actual loads, and the costs and consequences of bridge failure. Changes in TS&W limits may impact these safety margins, possibly increasing the number of bridges that must be replaced or posted with signs indicating bridge capacity.

State transportation agencies rate bridges using an "inventory rating" or an "operating rating" approach to determine when a bridge should be posted to prevent its use by certain vehicles. The inventory rating is more conservative than the operating rating, allowing a greater margin of safety. Past TS&W studies used the inventory rating, operating rating or some compromise assumption between the two, to indicate the requirement for bridge replacement, given changes in TS&W limits.

The current study uses the bridge stress criteria as established for the Federal Bridge Formula (FBF) to indicate bridge replacement requirements. This approach is more consistent with actual TS&W regulatory practice which is controlled by FBF, than is using either the inventory rating or operating rating to define bridge deficiencies. These issues are discussed in greater detail in Chapter VI.

Figure II-12. Factors Affecting Pavement Life

The life of a pavement is determined by a number of factors: vehicle loading (axle loads, tire footprint and suspension systems), traffic volume and mix, environment, subgrade condition, initial pavement design, initial construction practices, maintenance, and pavement age.

Roadway Geometry

In some cases, the scenario vehicles will perform differently than vehicles in the current fleet. For example, long double-trailer combinations have difficulty negotiating many interchange ramps and grade-level intersections. In addition, some require staging areas where they can be assembled or broken down, allowing pickup and delivery with shorter combinations. Such performance characteristics may necessitate modifications to existing roadway geometric design features.

Work commissioned for this study examined the relationship between the operating characteristics of the replacement configurations and the geometric elements of the current highway system. Geometric improvements required to accommodate the "worst" vehicles in the new scenario fleet were determined as were their associated costs. In addition, the cost of providing staging areas was estimated. Geometric costs are discussed in greater detail in Chapter VII.

Safety

Extensive research conducted for the study in the area of truck safety demonstrates that crash rates cannot be reliably predicted for many of the vehicle configurations considered in the alternative TS&W policy scenarios. Therefore, while changes in crash exposure (that is, VMT) by configuration are available, the change in the aggregate number of crashes for a given scenario cannot be reasonably estimated.

As discussed earlier in the section on freight diversion, changing TS&W limits may alter travel patterns. For example, depending on the scenario, the expanded operation of certain configurations could result in their operating in different regions of the country. Also, the vast majority of LCVs currently operating are restricted to certain highways. Quantifying the new safety profile for operations under the illustrative scenarios is extraordinarily difficult because historical crash rates cannot be reliably applied to new travel patterns, as they would reflect what would have occurred under existing operating conditions and not what could occur under new conditions.

Another factor complicating the estimation of crash rates, given changes to TS&W policies, is that the population of large commercial trucks, other than semitrailer and STAA double combinations, currently is a small portion of the truck fleet. Consequently, there is little data directly correlating TS&W factors to type, frequency, and cause of roadway crashes.

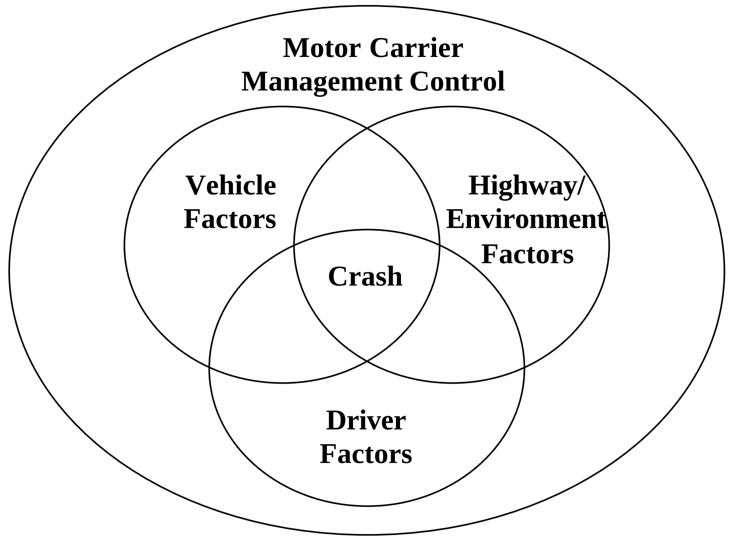
Further, TS&W effects must be isolated from other safety variables before precise numbers of accidents may be determined. The physical characteristics of vehicles play a role in motor carrier safety experience along with the important and interrelated factors of driver performance, roadway design, and traffic environment. Figure II-13 shows interrelationships between the major factors contributing to truck crashes.

However, valuable information about relative vehicle stability and control properties is available. Figure II-14 describes key vehicle stability and control considerations associated with TS&W changes. Work commissioned for the study indicates that differing vehicle stability and control properties combined with new truck travel patterns will affect crash rates and numbers. For example, all vehicles (including trucks) traveling over two-lane roads experience significantly increased crash risks compared to those traveling on the Interstate System and other higher design roadways. The majority of fatal crashes involving trucks occur on highways with lower geometric standards.
Also, higher traffic densities in populous areas exacerbate handling and stability problems with certain vehicle configurations.

Traffic Operations

The introduction of new truck configurations could have significant effects on the operations and the level of service on the highway network. The study estimates passenger car equivalents for a variety of truck configurations; also included are estimates of the differences in overall delay (expressed in vehicle- hours) that may occur with operation of the new truck configurations. These differences result primarily from changes in the number of trucks on the highways and their speeds relative to the automobile population. Chapter IX also discusses other operational impacts that are more difficult to quantify.

Figure II-13. Factors Contributing to Truck Crashes



Environmental Quality and Energy Consumption

Environmental impacts evaluated in the study include air and noise pollution. Procedures to estimate impacts of air and noise pollution that were developed for the 1997 *HCA Study* are used in this analysis. In general, environmental quality and energy consumption impact assessments are a function of VMT, although certain pollution impacts involve many other factors.

Motor vehicles produce emissions that damage the quality of the environment and adversely affect the health of human and animal populations. The economic cost of changes in air pollution levels resulting from alternative TS&W policy scenarios could not be estimated within the scope of this study. The Department continues to work with the Environmental Protection Agency to develop estimates that adequately

Figure II-14. Vehicle Stability and Control Considerations

Because of differences in vehicle stability and control, some larger and heavier trucks are more prone to rollover than are other trucks; some are less capable of successfully avoiding an unforeseen obstacle when traveling at highway speeds; some negotiate tight turns and exit ramps better than others; some can be more reliably stopped in shorter distances than can others; and some climb hills and maneuver in traffic better than others.

reflect the latest understanding of the costs of motor vehicle emissions.

Noise emissions from motor vehicle traffic are a major source of annoyance, particularly in residential areas. For this study, noise costs were estimated using information on the reduction in residential property values caused by noise emissions. Estimates of noise emissions were developed using Federal Highway Administration noise prediction models.

The change in fuel consumption given alternative vehicle configurations is also of interest. This was estimated using engine performance models, for each scenario, based on fuel economy by vehicle weight. Total fuel consumption is strongly influenced by changes in VMT.

Rail Impacts and Shipper Costs

Beyond the issue of motor carrier productivity is that of shipper costs. If carriers are able to transport the same quantity of freight in fewer trips, their costs will go down. The motor carrier industry is considered sufficiently competitive for cost savings to be passed on to shippers as lower rates. This is generally true of the rail industry as well.

This analysis quantifies the magnitude by which costs to shippers will increase or decrease. Examined are (1) rail shippers that continue to ship by rail, (2) rail shippers that switch to truck, and (3) truck shippers that continue to ship by truck. All three groups of shippers will potentially experience changes in their rate structures as a result of changes in truck sizes and weights.

A shipper that can take advantage of more productive truck configurations could realize lower total transportation and logistic costs. However, rail shippers that could not economically switch to trucks might face increased costs as railroads spread fixed costs over a smaller shipper base.

Also, a portion of rail customers will experience lower rates resulting from rail industry attempts to maintain traffic in the face of lower truck rates. The rail impact analysis estimates the likely rate increases for remaining rail traffic necessary to cover fixed costs. In other words, the "contribution to fixed costs" lost because of diverted traffic would be recouped by increasing rates for the remaining rail traffic, potentially impacting future demand for rail service and, therefore, the financial status of the rail industry.

Thus changes in Federal TS&W limits may affect costs not only for shippers using trucks, but also for rail shippers as railroads respond to new market conditions.