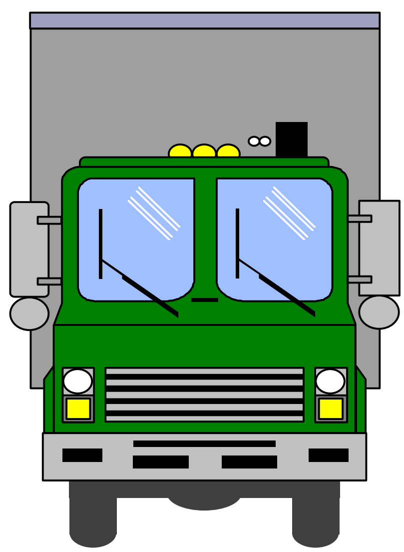
CHAPTER 2

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 1, 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.

Exhibit 2-1 provides an overview of the analytical framework. The structure reflects input from the extensive outreach process underlying the Study and from the DOT's Policy Oversight Group (POG). The participatory and oversight features of the Study were described in Chapter 1.

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

The POG and Multimodal Advisory Group (MAG) identified a set of illustrative scenarios for initial evaluation. In addition, the MAG determined that two policy proposals, initiated by external groups, would also be analyzed for this effort.

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 would be permitted, and (4) other key assumptions.

This chapter provides an overview of the analytical process. Subsequent chapters provide discussions of the impacts addressed, the analytical methodologies employed, and the findings pertaining to the scenarios evaluated.

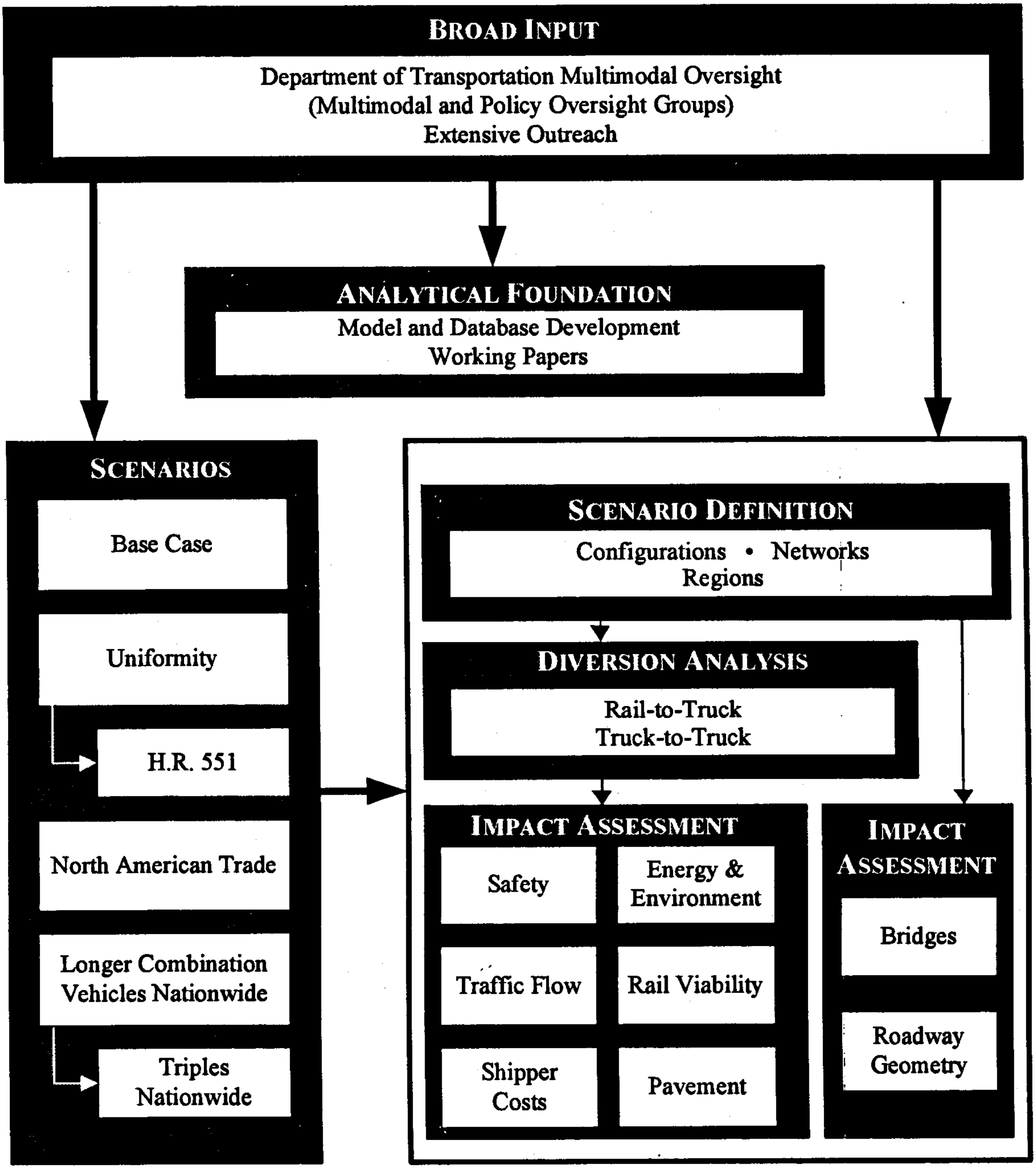
TECHNICAL FOUNDATION

The analytical component of the Study was developed along four distinct tracks. The first focused on producing background studies to identify current issues and trends related to freight markets and motor carriers. Thirteen working papers were commissioned for the Study. The papers describe the state-of-the-knowledge in critical areas as they relate to TS&W discussions. (See "Working Papers", box below.)

WORKING PAPERS

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

EXHIBIT 2-1
1998 COMPREHENSIVE TRUCK SIZE AND WEIGHT
ANALYTICAL FRAMEWORK
OVERVIEW

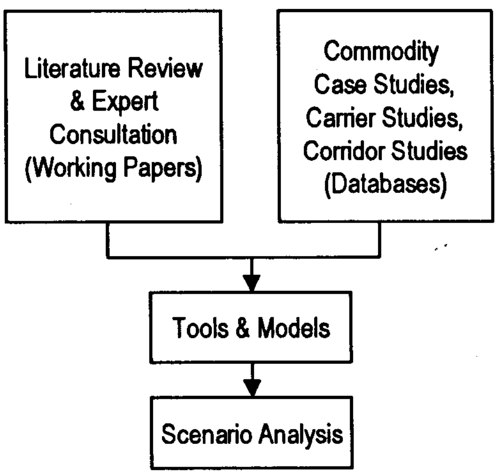


The second track involved work to support development and calibration of the analytical tools. Activities included developing databases to describe truck weights, body types, commodities and truck flows; conducting commodity case studies covering the transportation of coal, farm products, petroleum, 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 producing tools and models designed to analyze the broad range of Study impacts. These tools include a vehicle stability and control performance database and database analyzer; long- and short-haul freight diversion analytical models and a companion load shift model; and bridge, rail industry, highway geometry and traffic operations impact analysis models.

Finally, the fourth track brings together the products resulting from the earlier work to evaluate alternative illustrative TS&W policy scenarios.

TRUCK SIZE AND WEIGHT ANALYTICAL PROCESS



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 which could be used to define alternative policy scenarios. To produce a thorough and comprehensive Study, a wide range of truck configurations were evaluated in order to understand the consequences of keeping current TS&W limits as well as restricting or expanding them.

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 inclusion of a configuration at a gross vehicle weight (GVW) above or below current limits or on a certain network does not imply a predisposition of the DOT toward its adoption. Rather, the scenarios are intended to demonstrate the capability of the analytical tools and to provide an approximation of the likely impacts of alternative TS&W policies.

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 account for changes in commercial vehicle highway user fees that could accompany changes in TS&W limits.

Another important, but not necessarily realistic assumption is that current highway construction practices are assumed unchanged throughout the analysis period. We know, however, that pavements can be built to accommodate heavier axle loadings, as is done in Europe. A full life-cycle cost analysis would include the significant tradeoffs of initial cost requirements, recurring public and private costs, and the extent of the system that could be brought up to a higher standard. An undertaking of this magnitude was considered far too large for this Study.

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; 28- and 33-foot double trailer combinations; and longer combination vehicles (LCVs). They are illustrated in Exhibit 2-2. The configurations are analyzed at operating weights based on assumptions about axle weight and bridge overstress criteria.

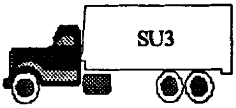
It should be noted that a large set of truck configurations, some of which are not specifically addressed in the Study scenarios (and therefore not depicted in Exhibit 2-2), were considered in developing the vehicle stability and control, vehicle offtracking, and roadway geometry impact databases. These 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.

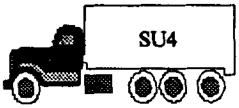
The nomenclature describing the vehicles in Exhibit 2-2 provides a useful shorthand for referring to the Study configurations. The first number in the series indicates the number of axles on the power unit; the next set (alphanumeric), refers to the number of axles supporting the trailing unit (a semitrailer 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.

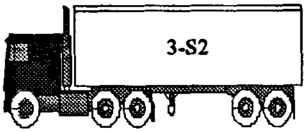
EXHIBIT 2-2
1998 COMPREHENSIVE TRUCK SIZE AND WEIGHT STUDY
ILLUSTRATIVE TRUCK CONFIGURATIONS

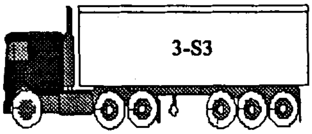
Single Unit Trucks



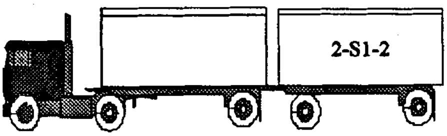


Tractor-Semitrailer Combinations



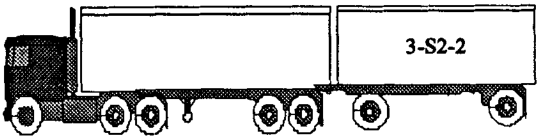


STAA Double-Trailer Combinations

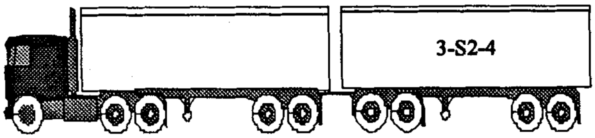


STAA or Western Double

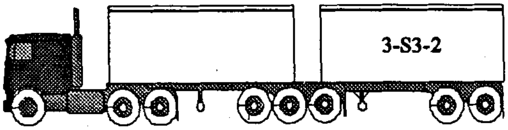
Longer Combination Vehicles



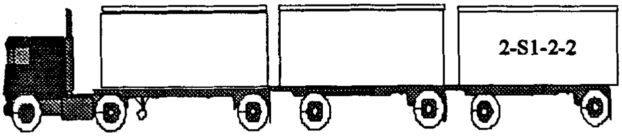
Rocky Mountain Double



Turnpike Double



8-Axle B-Train Double Trailer Combination



Triple-Trailer Cobination

NETWORKS AND GEOGRAPHIC UNITS

The configurations are evaluated in relation to various highway systems--the National Network (NN) for Large Trucks, the National Highway System (NHS), and two limited systems of highways tailored for the operation of LCVs. The LCV networks were developed to suit the analytical requirements of the Study. For purposes of this analysis, all configurations are assumed to be allowed to operate nationwide.

Analytical networks were required for the Study in order to test the impact of the scenario TS&W limits on diversion of freight to other truck types or from rail.

County-to-county mileage tables were created for three different networks, the NN for Large Trucks and two theoretical LCV networks. All networks used the "National Transportation Atlas Data Base: 1995" from the DOTs Bureau of Transportation Statistics.

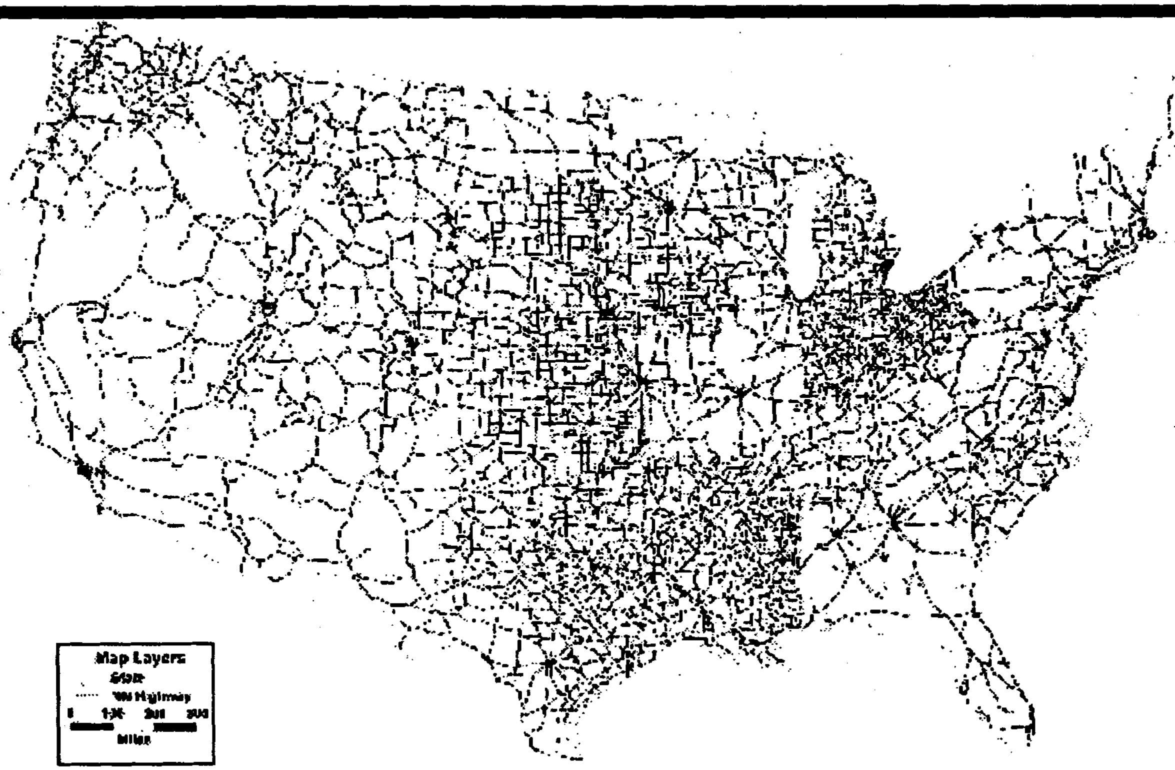
The utilization of specific roadway networks allows proposed changes to the TS&W limits to be measured on specific highway functional classes within each State.

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 refered 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 these trailer lengths. Today, with over 200,000 miles of roadway, the NN includes the Interstate System (44,000 miles) as well as other highways. States are required to allow reasonable access for the STAA vehicles to and from the NN. Exhibit 2-3 provides a map of the NN.

EXHIBIT 2-3
NATIONAL NETWORK FOR LARGE TRUCKS



NATIONAL HIGHWAY SYSTEM

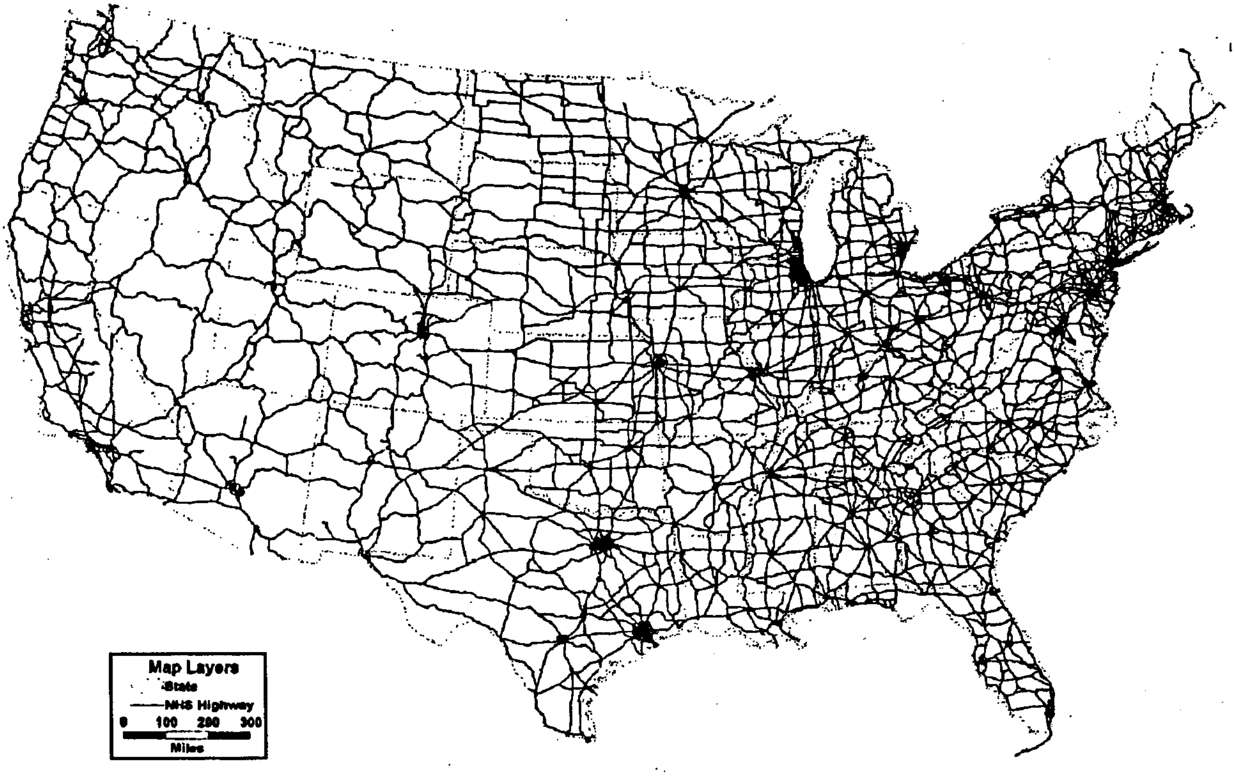
With the National Highway System Designation Act of 1995, Congress established the NHS. This system, which includes 156,986 miles, consists of the highways of greatest National interest, and includes the Interstate System, a large portion of the other principal arterial highways, and a small portion of mileage on the other functional systems. The NHS is depicted in Exhibit 2-4.

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), see Exhibit 2-2] consists of 42,500 miles and provides for continuous east to west travel.

EXHIBIT 2-4
THE NATIONAL HIGHWAY SYSTEM



This network consists of access-controlled, interconnecting 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 mostly rural Interstate facilities. 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 are far more extensive than would be politically or practically feasible and thus tend to overestimate the impact of TS&W policy options addressing LCVs. Maps of these networks are provided at Exhibit 2-5 and 2-6.

EXHIBIT 2-5
1998 COMPREHENSIVE TRUCK SIZE AND WEIGHT STUDY
ANALYTICAL NETWORK FOR LONGER COMBINATION DOUBLE-TRAILER VEHICLES

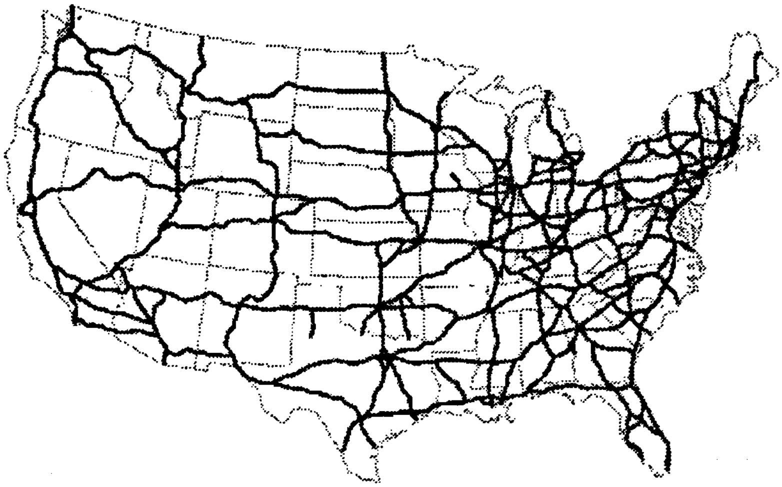
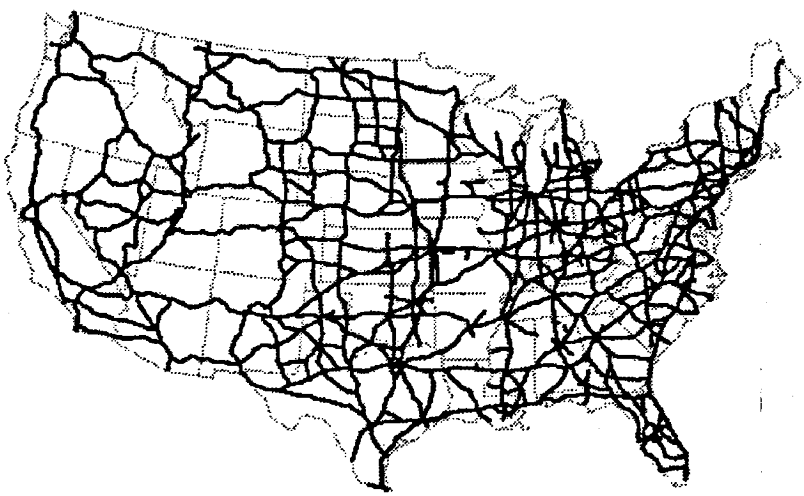


EXHIBIT 2-6
1998 COMPREHENSIVE TRUCK SIZE AND WEIGHT STUDY
ANALYTICAL NETWORK FOR LONGER COMBINATION TRIPLE-TRAILER VEHICLES



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.

The DOT anticipates that, over time, additional policy options will be advanced for analysis. The analytical 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 3.

ILLUSTRATIVE SCENARIOS

BASE CASE

The Base Case serves as a base line for the other scenarios and retains all features of current law (see "Current Federal TS&W Limits" box, this page.). It 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

CURRENT 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.

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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 are somewhat unrealistic in as much as States can and will make TS&W changes 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). Therefore, all changes measured in the scenario analysis may be assumed to result from the proposed TS&W changes.

UNIFORMITY SCENARIO

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 for Large Trucks, resulting in nationally uniform weight limits on the NN.

NORTH AMERICAN TRADE SCENARIO

The North American Trade Scenario is focused on accommodating trade among the North American trading partners. This trade could be facilitated by allowing the operation of six-axle tractor-semitrailer combinations at 97,000 pounds. Under this scenario, a 51,000-pound tridem-axle weight would be allowed. Currently, the weight allowed on a three-axle group is limited by the Federal bridge formula. A 51,000-pound tridem-axle weight limit could also provide for the legal transportation of 40-foot containers loaded to maximum international weight limits. (See "Tridem Axles" box, this page.)

> <u>TRIDEM AXLES</u>
>
> 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*

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 and control and infrastructure impacts. Under these limits, a six-axle tractor semitrailer combination could operate at 90,000 pounds. In addition, this could provide a productivity increase for short wheelbase straight trucks.

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.

SPECIAL REQUEST POLICY SCENARIOS

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 grand-fathered). 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 by the existing TS&W analytical approach because a freeze on future changes in TS&W limits is assumed for the Study's Base Case Scenario, to which the illustrative scenarios are compared. 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 on a designated nationwide 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

Changes in the Nation's TS&W limits, which determine the maximum payload that vehicles may carry, will influence motor carrier productivity. In general, increases in TS&W limits will increase the tonnage and/or volume of freight that may be carried per vehicle per trip (see "Weigh-Out versus Cube-Out Freight" box, page 2-13.) Consequently, in a no freight growth environment, fewer trips would be required to carry the same amount of freight, thereby decreasing tractor vehicle-miles-of-travel

(VMT) and reducing trucking costs. (In the case of the LCVs Nationwide Scenario, the total number of trailers on the highways would remain more or less constant.) Alternatively, more restrictive TS&W limits would increase trips, tractor VMT, and trucking costs.

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.

Changes in truck costs and rates may cause a change in the selection of transport mode for some shipments. 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 type and rail car miles for boxcars and intermodal traffic. This information is extremely important to the overall Study because most of the impact analysis methodologies—such as in the areas of pavement and energy consumption—depend upon estimates of VMT by truck configu-ration. A collection of state-of-the-art diversion models was 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 "Pavement Life" box, this page) is of interest because rough pavement affects the cost of all travel. These costs relate to vehicle operations, delay, crashes, as well as increases in the costs borne by public agencies to preserve acceptable pavement quality.

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.

According to engineering principles, pavement deterioration increases with axle weight and with the number of axle loadings which a pavement experiences. The Study relies on a pavement deterioration model to predict the requirement for road maintenance and construction expenditures, given alternative TS&W policy assumptions.

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 the expected maximum 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 practice which is controlled by FBF, than is using either the inventory rating or operating rating to define bridge deficiencies (see "Relationship of Overstress Criteria to Design Stress and Bridge Ratings" box on page 6-6.)

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.

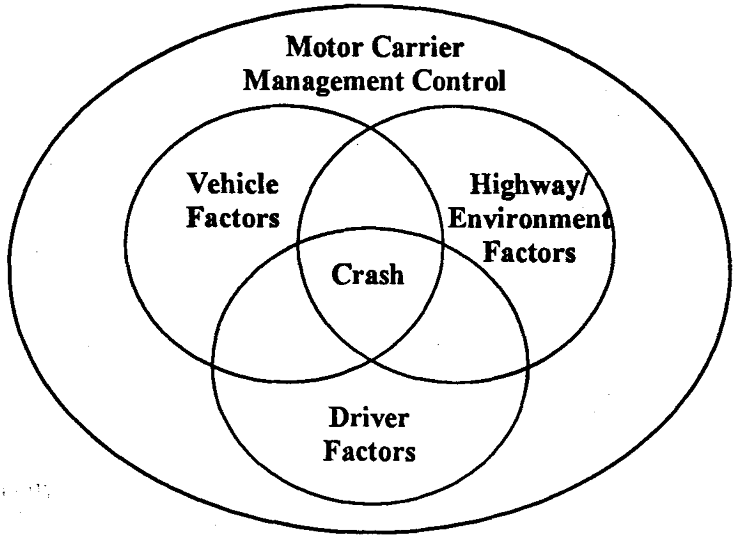
Work commissioned for this Study examined the relationship between the operating characteristics of the replacement configurations and the geometric elements of the current highway system. Geometric improvements required to accommodate the "worst" vehicles in the new scenario fleet were determined as were their associated costs. In addition, the cost of providing staging areas (see "Staging Areas" box on page 7-5) was estimated.

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 determined.

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 vehicles subject to the ISTEA freezes, in States that presently allow their use under revocable special permits, are restricted as to where they may operate. Quantifying the new

INTERRELATIONSHIP OF CONTRIBUTORY TRUCK CRASH FACTORS



safety profile 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 represents a small subgroup of all vehicles. Consequently, there is a shortage of 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 inter-related factors of driver performance, roadway design, and traffic environment. (See "Interrelationship of Contributory Truck Crash Factors" box, this page.)

However, valuable information about relative vehicle stability and control properties is available (see "Vehicle Stability and Control Impacts" box, this page.) 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

VEHICLE STABILITY AND CONTROL IMPACTS

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.

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 operational characteristics and quality of service on the highway network. The Study provides estimates of 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.

ENVIRONMENTAL QUALITY AND ENERGY CONSUMPTION

Environmental impacts evaluated for the Study include air and noise pollution. Procedures developed for the *HCA Study* are being applied for the *CTS&W Study*. 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 cost of changes in air pollution levels resulting from alternative TS&W policy scenarios are not currently available. The Department is working with the Environmental Protection Agency to develop estimates that adequately 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. 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 or (2) rail shippers that switch to truck as well as (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.

Inter- and intramodal diversion, therefore, has the potential to change costs borne by the Nation's shippers.