

Motor Vehicle Size and Weight Considerations

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Freight transport by commercial motor carriers will continue to play a vital role in the U.S. economy. In 1992, for-hire and private motor carriers accounted for 65 percent of the total contribution of transportation-related services to the U.S. gross domestic product (GDP) and 3.3 percent of the total U.S. GDP (1). In that year, 6 million medium and heavy commercial trucks in this country hauled freight a total of 152.5 billion miles (2), nearly 7 percent of all vehicle miles of travel (VMTs) that year. These VMTs are growing at an annual rate of 2.5 percent, and the VMTs of combination-unit commercial trucks are growing at an even higher rate (3.5 percent).

Currently, trucks routinely account for close to 40 percent of the traffic mix on certain segments of interstate highways and at certain times of the day, and overall traffic density frequently approaches or exceeds maximum free-flow capacity limits. It is anticipated that the truck portion of the traffic mix will continue to increase. Simultaneously, truck accidents and fatalities are rising, as is public concern about this trend and the increasing disparity in size between passenger vehicles and commercial trucks. Against this backdrop, strong political debate will be generated by economic pressure to increase the maximum allowable limits for truck size and weight, to improve productivity improvements, and to handle the large-and-growing highway volume. Achieving this seemingly straightforward goal will not be simple. Several potentially conflicting public policy issues are involved.

STATE OF THE PRACTICE

In recent years, the availability of high-quality, objective technical and public policy research literature—essential in addressing issues related to controlling traffic mix—has increased significantly. For example, the effects and costs of individual axle weights and arrangements on pavements (and overall weights and vehicle configurations on bridges) have been clarified. Similarly, the effects of the interaction among vehicle configuration, roadway geometry, and traffic operations have been better defined. Furthermore, methods for assessing the effects of various vehicle designs, configurations, axle arrangements, weights, and cargo loadings on dynamic handling and stability—and in turn, safety—have been developed. From these data arise the possibility that objective, performance-based evaluation methods and acceptability criteria could be developed; the new criteria, in turn, might lead to the development of responsible, reasonable, balanced trade-offs for increased weight.

In the public policy arena, new information is available for assessing not only the costs directly related to highway infrastructure, necessitated by the use of larger, heavier vehicles, but also the degree to which federal truck-user fees cover those costs (3). Additionally, if freight traffic should shift to trucks, the range of potential, long-term strategic

consequences on other freight transportation modes—principally railroads—must be assessed. Safety consequences and public opinion about sharing the road with larger, heavier trucks also must be gauged.

CHALLENGES AND OPPORTUNITIES

Addressing issues related to motor vehicle size and weight requires balance while accommodating change. An objective, rational approach to truck size and weight policy must be developed—a significant departure from prevailing procedures.

As presently conceived, U.S. truck size and weight limitations are a mishmash of federal, state, and local requirements, whose origin and development evolved and then were subsequently fragmented, jurisdiction by jurisdiction. Lack of any rationalized approach to establishing these standards has resulted in significant differences among jurisdictions, principally on the noninterstate portion of the nation's roadway system. Federal requirements generally tend to have an overall limiting effect, because most vehicles operate on the interstate and national highway systems at one time or another. These differences limit a given motor carrier's operational flexibility, depending on whether those operations are local, regional, or national in scope. Thus, consistent regulation of the industry across the nation would have to be achieved at the federal level, within a framework ensuring an appropriate uniformity and balance while allowing latitude, flexibility, and decision making at the state and local levels.

The research currently available indicates that national consensus on the wholesale use of significantly larger vehicles will not be easy to obtain. Nevertheless, certain opportunities may exist, such as the following:

- Nationally—controlled use of well-designed, high-performance vehicles that are somewhat larger than those in present use, and
- Locally and regionally—constrained use of larger vehicles with better performance characteristics, if restrictions would not pose inordinate safety risks or create cross-modal imbalances.

These possibilities presume that an effective safety control and sanctioning system could be implemented and that adequate cost-recovery mechanisms would be established to recoup the costs of using these vehicles.

LOOKING AHEAD

Public policy must address whether to allow the operation of larger and heavier trucks and under what conditions, if any. At different times, the question will be framed in terms of allowing incremental increases locally (within a state) or regionally (within adjoining states); in other cases, however, national uniformity will be sought at increased levels, for example, to allow national network or corridor-type operations. Nevertheless, because of the overall limiting nature of federal requirements, the debate will be principally at the national and continental (North American) levels. Achieving consensus will be a significant challenge, but continuing to attack the problem piecemeal is not in any one's best long-term interests.

Success hinges on finding solutions to balance all interests and concerns and to address the following issues:

- Safety, including the need to ensure the enforceability and practical ease of implementing any safety regulations or other countermeasures, uniformly and rigorously, across the jurisdictions where larger and heavier vehicles might be allowed;
- Incrementally higher costs of infrastructure (pavements, bridges, and geometric design) attributable to the use of larger and heavier vehicles and how these costs would be recovered;
- Sorting out the roles of federal, state, and local governments in regulating traffic and equipment as well as interstate and international commerce;
- Flexibility to accommodate differences in transportation requirements across regions and commodities;
- Minimizing impacts on captive freight shippers while ensuring the long-term strategic viability of alternate transportation modes and intermodal movements;
- Environmental and other quality-of-life issues;
- Use of advanced technology in highway and vehicle monitoring and data collection; and
- Effects on the efficiency and safety of automobile travel.

One possible way to accomplish all these goals might be to differentiate broadly between the large population of current typical vehicles (i.e., two- and three-axle single-unit trucks $\leq 54,000$ pounds and combination units $\leq 80,000$ pounds) and the much smaller, specialized group of highly productive large vehicles. This latter group presents unique concerns that warrant separate and more rigorous treatment. Past studies have pointed to a nationally uniform, permissive, state-based special permit program as a basis for dealing with the concerns that need to be addressed for this group of vehicles. Such a program, if properly structured, could be objective, systematic, rigorous, and credible. This basic approach, endorsed in TRB Special Report 225 (4) and by the trucking industry, could be the basis for forward-looking, collaborative efforts between federal and state governments.

Because safety concerns have been the primary stumbling block, it seems appropriate to focus first on those. One suggestion has been to establish some nationally agreed-on standards and conditions of use that can be rigorously followed. These standards would ensure that the basic designs of the vehicles were optimized for safety and that their use was restricted—depending primarily on their size—only to those locations where they were deemed appropriate. Any program to accomplish this task should have at its core state—and in some cases, local—authority to determine appropriate truck sizes and weights, according to national standards and fixed criteria.

In the case of larger and heavier trucks (i.e., single-unit trucks $> 54,000$ pounds and combination units $> 80,000$ pounds), national consensus is unlikely on the appropriateness of allowing all sanctioned or approved vehicles or vehicle configurations to operate everywhere. What might be possible, however, would be an array or catalog list of safety acceptable vehicles and configurations from which jurisdictions could choose the larger and heavier vehicles to allow in their jurisdiction.

Depending on the capabilities of each jurisdiction's infrastructure and prevailing traffic conditions, some vehicles and configurations could be acceptable under some circumstances. The process of determining acceptable blueprint vehicles could effectively be sanctioned and cataloged through organizations such as the Society of Automotive Engineers to address concerns that this process would be too complicated. The American

Association of State Highway and Transportation Officials could be enlisted to develop a method for assessing the ability of a given roadway segment, coupled with its typical traffic volumes, to handle the variety of blueprint vehicles that would become available.

National concerns would be addressed under such an approach if credible assessment methods and acceptability criteria were established in four areas:

1. Adequacy of user fees to recoup the federal roadway system's costs for maintaining or repairing damage attributable to larger vehicles, to provide funding for adequate staffs at the state level to administer special permit programs, and to support vehicle and route certification efforts;
2. Infrastructure preservation criteria (primarily for pavement and bridge wear);
3. Safety assurance, primarily so that truck dynamics and stability are as good as or better than current vehicles, but also so that negative interactions do not develop with cars, and so that carrier performance and adherence to program requirements can be tracked using the national intelligent transportation systems architecture in data collection and reporting; and
4. Funding and implementation of rigorous enforcement programs with effective sanctions, fines, and other mechanisms, all but eliminating incentives to violate the agreed-on standards.

The acceptability of a given vehicle or vehicle configuration and programs that permit its use would be gauged by its ability to accomplish these objectives. Programs to ensure that these objectives were met would need to be substantive, verifiable, performance-based, and uniformly implemented. Uniformity is the key. Without it, jurisdictions that attempt to maintain a responsible level of stringency in their programs could be viewed as being unnecessarily and overly restrictive; they also would find themselves at an untenable political disadvantage if neighboring states had less restrictive requirements. History has shown that the net effect would be a "lowest common denominator" set of requirements that many would view as being inadequate.

Such a system could provide enough flexibility to credibly allow use in locations and regions where risk would be minimal and controlled while ensuring that in high-risk situations, use would be either more constrained or prohibited. Also, because national use probably would be constrained, modal strategic imbalance issues likely would be minimized—if not eliminated—as a cause of concern. Establishing such a system would be a formidable but not impossible task that requires the cooperation and input of many potentially affected groups.

COMMITTEE'S ROLE AND CONTRIBUTION

If consensus were to emerge around the special permitting concept described above, the Transportation Research Board (TRB) Committee on Motor Vehicle Size and Weight (A1B04) could follow one avenue that could move this issue forward. The committee could provide a forum for technical discussions of these issues and advocate research and pilot projects that focus on working out the details of developing and implementing the technical and administrative programs outlined in this paper. Specifically, uniform methods must be developed to easily rate and report the handling and stability performance capabilities of various vehicle configurations in a decentralized but uniform way that, in turn, could be

easily verified by state and local officials. Likewise, methods are needed for uniformly and objectively rating the suitability of given road segments to safely accommodate various vehicle configurations, codependent on prevalent traffic conditions and volumes. An additional method is needed for blending the results of the vehicle configuration and route assessments in a simple algorithm that matches the two in an acceptability matrix. This algorithm also must be easy to use by state and local officials.

On the infrastructure side, uniform protocols must be developed for evaluating bridge and pavement capabilities. On the administrative front, study and consideration need to be given to structuring uniform state-level safety control and sanctioning and cost-recovery systems for large and heavy trucks.

On a broader, longer range scale, the committee could support additional research on several technologies (e.g., board weighing and recording, infrastructure-based weigh-in-motion, trip and route recording) that can potentially make size- and weight-enforcement efforts more efficient, effective, and equitable. The committee should collaborate with other TRB committees on a wide range of issues related to commercial vehicle safety, energy, and the environment that apply to all types and sizes of trucks and operations. These issues include

- Enhancing driver skill and performance,
- Incorporating crashworthiness and crash-avoidance technologies on commercial vehicles,
- Reducing emissions, and
- Improving energy efficiency.

The committee also could branch out to cover size and weight issues that involve vehicles besides heavy trucks; it could investigate, for example, the technical and policy implications (safety, air quality, energy consumption, and cost recovery) associated with the growing number of light trucks and sport utility vehicles. Similarly, the large, heavy transit and over-the-road buses that are becoming increasingly prevalent also could be studied.

REFERENCES

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