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Reason

Toll Truckways: A New Path Toward Safer and More Efficient Freight Transportation

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Introduction

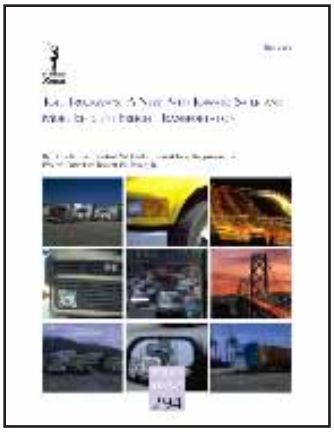
Today's debate over possible increases in truck size and weight assumes that the increased efficiency made possible by longer and heavier trucks could only be purchased at the cost of reduced highway safety. This study suggests that America can have both increased safety and higher productivity.

Trucks deliver 90 percent of the value of U.S. freight, and trucking charges are more than $610 billion a year. Longer combination vehicles (LCVs), like those used in some western states and in Canada, permit a single driver to carry several times the payload that is permitted in most states under the 1991 federal "freeze" on truck sizes and weights. Very significant savings in truck shipping costs are therefore possible if long trucks can be safely accommodated in much of the country where federal law currently bans them.

Highway crashes involving trucks result in nearly 5,000 deaths per year. Thus, auto clubs and safety organizations are concerned about LCVs being added to busy highways where they would mix with cars and potentially pose greater risks of car-truck accidents. In addition, state departments of transportation (DOTs) are rightly concerned that many inter-city highways are not designed to take the loads imposed by today's LCV configurations.

This study proposes a new alternative: adding specialized heavy-duty truck lanes to existing major highways, especially long-distance Interstate routes in states that do not currently permit LCVs. In those states, LCVs would be permitted to operate, but only on the new lanes, which would be for trucks only. These lanes would be barrier-separated from general traffic to form separate truckways. Our feasibility analysis concludes that the productivity gains made possible by these truckways would be so large that trucking firms, we believe, would willingly pay tolls to make use of them (and would still come out way ahead, after paying the tolls). We therefore call these self-financing lanes Toll Truckways.

This is a summary of *Toll Truckways: A New Path Toward Safer and More Efficient Freight Transportation,* Policy Study No. 294, June 2002, www.rppi.org/ps294.html.



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Lessons from DOT's Truck Size & Weight Study

The federal government began regulating truck size and weight in 1956, as part of the law creating the Interstate highway system. This law included a "grandfather clause" permitting states with limits higher than the federal ones to keep them. The federal limits were increased in 1975, at a time when trucking companies were being hit by soaring diesel fuel bills. And in 1982 Congress required states to allow single semi-trailers up to 48 feet long and twin-trailer combinations with 28-foot trailers on the National Network, a set of major inter-city routes including the Interstates. In the 1991 ISTEA (Intermodal Surface Transportation Efficiency Act) legislation, Congress enacted the "LCV freeze" on Interstates. It prohibited any modification of truck size and weight limits, leaving most states with a maximum gross weight limit of 80,000 lbs. By comparison, the turnpike double used in a small number of states (under the grandfather clause) has a gross weight of 148,000 lbs. and a payload double that of the smaller big-rigs.

The U.S. Department of Transportation (DOT) in August 2000 released the results of a major study of the potential costs and benefits of liberalized truck size and weight limits. The DOT study did not look into specialized truck lanes; rather, it estimated the cost of strengthening and rebuilding all lanes and bridges on much of the Interstate highway system (and some other major routes) to handle LCVs. And it also estimated the savings in shipping costs that would come about, due to more widespread use of LCVs. Table 1 is our summary of DOT's work, comparing their five different scenarios, with the associated costs and benefits. The first would eliminate the present "grandfather" provisions that now permit LCVs to operate in a limited number of mostly western states. The other four represent various possible types of LCVs operating on various portions of the inter-city highway system.

As can be seen, for each scenario the table includes both savings and costs. For the first scenario, which eliminates the current modest usage of LCVs, the net cost to the economy would be $7 billion per year. But greater use of LCVs, on pavement designed to handle them, would yield net economic benefits ranging from $9 billion to over $40 billion per year.

But that is after including the costs of strengthening and rebuilding a huge portion of the inter-city highway system. Our approach suggests not going to that extreme. Instead, in corridors where there is significant truck traffic, we recommend building specialized heavy-duty truckways and leaving the rest of the lanes alone. In fact, those lanes will last a lot longer if a significant proportion of existing heavy truck traffic shifts from them to the new truckways.

Lessons from Canada and Australia

Canada and Australia are both modern western nations with long distances between cities and heavy use of trucks for long-haul freight. It turns out that both have gone farther than the United States in liberalizing truck size and weight regulations. Concurrently, they have focused on improving the safety of LCV configurations, and on keeping axle loadings compatible with pavement by adding axles and strengthening bridges where needed.

In both nations, liberalization has come about primarily on a provincial or state level; neither nation has imposed size

Table 1: Estimated Annual Savings from LCVs on Rebuilt Highway System ($billion)

Category ($B/year)	Uniformity	NAFTA 90K	NAFTA 97K	LCVs Nationwide	Triples Nationwide
Shipper savings	-$6.4	$10.9	$13.3	$26.7	$19.8
Congestion savings	-$1.9	$3.2	$3.2	$8.6	$22.4
Total savings	-$8.3	$14.1	$16.5	$35.3	$42.2
Pavement costs	-$0.4	-$0.15	-$0.12	-$0.02	No change
Bridge captial	-$1.0	$2.5	$3.3	$2.6	$0.8
Bridge construction congestion	No change	$2.5	$3.3	$2.6	$0.8
Geometry costs	No change	$0.01	$0.01	$0.36	No change
Total costs	-$1.4	$4.84	$6.49	$5.54	$1.60
Net savings	-$6.9	$9.26	$10.01	$29.76	$40.60

and weight regulations at the national level. In Canada, the 10 provinces and two territories negotiated a memorandum of understanding on "inter-provincial weights and dimensions" in 1999. Although each jurisdiction still specifies which of its highways can be used by trucks meeting the new limits, the result has been nationwide use of what are called B-doubles. This is a twin-trailer configuration in which the second trailer connects to the first via the same type of turntable (or "fifth wheel") as used on the rear of the tractor, rather than via a drawbar as in the United States (see Figure 1). Research in both Canada and Australia has found that this configuration is more stable and more maneuverable than the typical double trailer configuration used in the United States.

The other innovation which has spread rapidly in Canada is the triple-axle grouping, referred to as a "tridem" (also seen in Figure 1). What counts most in pavement damage is not the gross vehicle weight but the load per axle. A tridem grouping spreads a heavy load more widely, leading to much less pavement damage than if the same weight were carried by a typical two-axle grouping. Yet U.S. federal size and weight regulations make no provision for tridems, and they are used in only a few of the "grandfathered" states.

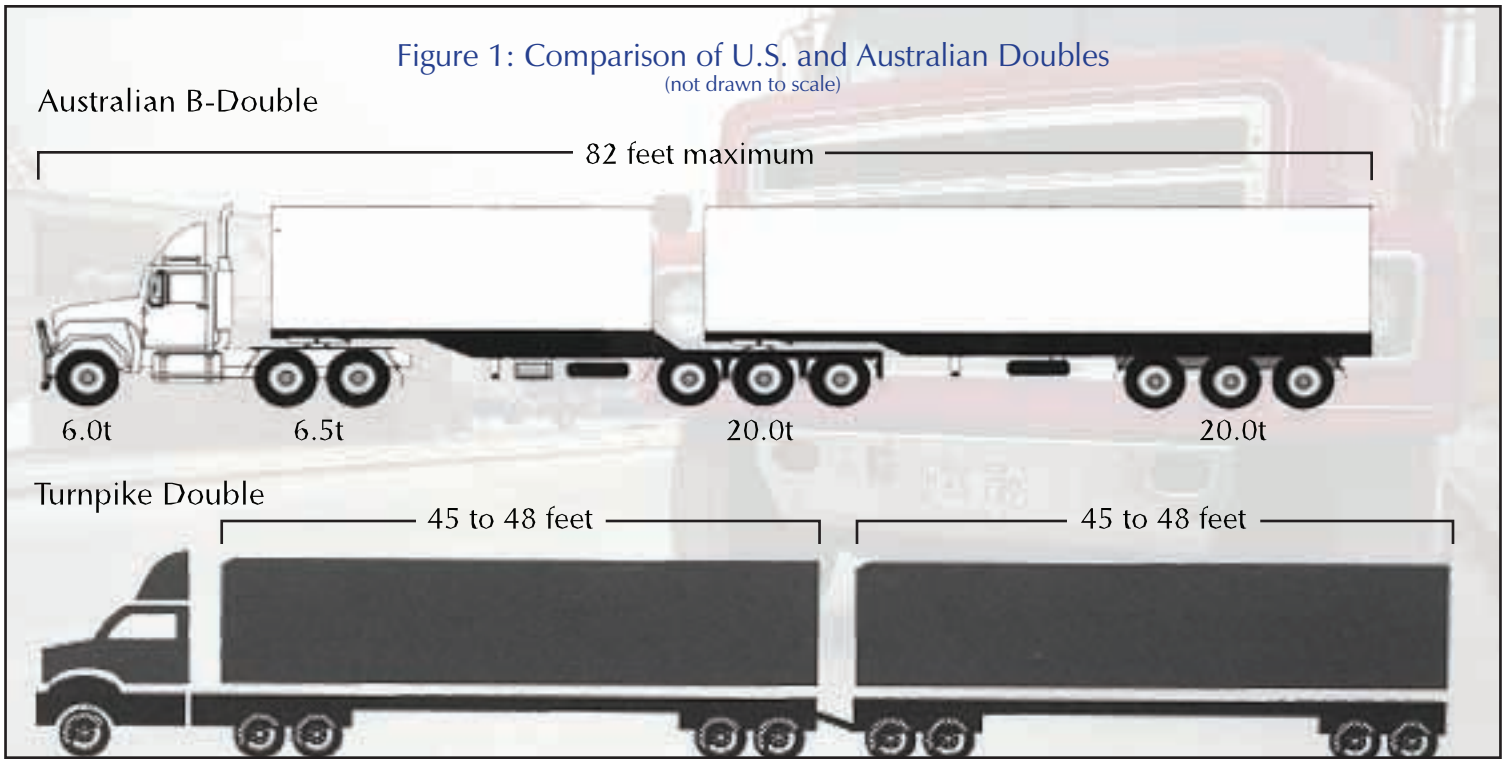
Australia's experience is quite parallel with Canada's, but has a longer history. As in Canada, truck regulation is a matter for the states and territories, but has been fostered nationwide by a National Road Transport Commission (NRTC) that has encouraged liberalization via performance-based standards. As in Canada, both B-doubles and tridem axle configurations have evolved as good solutions to the need for increases in both safety and capacity, consistent with pavement preservation. Australia also has extensive experience with triple and longer "road train" combinations in its Outback areas. While road trains are not suitable for other than "bush" roads, the Australians were quick to seize on the B-double as a long combination that was safe in heavy traffic and suitable for urban areas.

Australia's NRTC estimated that the 1999 increases in truck weights have led to economic benefits far greater than the increased costs. Gross annual savings were put at $285 million, while increased annual costs (pavement strengthening, road-friendly suspensions on trucks) were just $24 million, for net annual benefits of $261 million. The ratio of benefits to costs is 11.9.

Economic and Financial Feasibility of Toll Truckways

To get a quantitative handle on the feasibility of Toll Truckways, our modeling team at City College of New York used real-world data to create a model of a hypothetical truckway facility. It consisted of a single heavy-duty lane in each direction, with frequent passing lanes, built in the median of an existing Interstate. The Truckways would be separated from the regular lanes by concrete Jersey barriers.

Figure 1: Comparison of U.S. and Australian Doubles
(not drawn to scale)



There would be occasional staging yards near cities or junctions with other highways, at which LCVs would be broken down into individual truck/trailer rigs for travel to their ultimate destinations on ordinary highways.

The first step in the process was the design of a heavy-duty pavement configuration, which was tested for wear and maintenance requirements under various heavy-truck traffic conditions. The hypothetical corridor was an existing three lanes in each direction carrying 40,000 average daily traffic (ADT), of which 20 percent were assumed to be heavy trucks. To this corridor, the Truckway facility is added, and the pavement impact on both regular and Truckway lanes is estimated, depending on what fraction of the truck traffic moves to the Truckway lanes.

The second step was to analyze the productivity improvements which such Truckways would make possible. Instead of studying all possible LCV configurations, the analysis used two basic types of big-rig: the standard tractor/semi-trailer (18-wheeler) and the long (turnpike) double. The former is the most common long-haul truck in all 48 contiguous states, while the latter is the largest currently operational LCV in this nation (though permitted only in a small number of states). The impact of Toll Truckway implementation was analyzed both for states that currently are subject to the LCV freeze (80,000 lb. gross vehicle weight) and those with higher (grandfathered) limits; these were compared with the higher axle loadings that would be permitted on the Truckway lanes.

The results showed that striking gains in productivity are possible, if trucking companies take full advantage of the new, heavy-duty lanes. For states with the most restrictive limits (e.g., nearly all eastern states), the standard 18-wheeler could carry 115 percent more payload and the long double could carry 492 percent more payload.* For states that are already allowing LCV operations, the gains would be less dramatic, but would still be significant: 62 percent more payload for the 18-wheeler and 57 percent more for the long double.

Next, the modeling team looked at the toll potential of the Truckways. The assumption was made that truckers would be willing to pay, as a toll, up to one-half of the cost savings that they would gain by being able to operate LCVs on the new lanes. That provided a range of possible toll levels, from $0.43/mi. to $1.86/mi. However, subsequent analyses did not make use of numbers in the higher end of this range. The feasibility analysis estimated both the capital costs of building the Truckways and the operating and maintenance costs on both the existing lanes (now receiving less truck traffic) and the new truck lanes. Over a wide range of scenarios, the net present value of Truckway projects was found to be positive, indicating that they would produce net benefits for society.

The final portion of the analysis looked at the development and operation of Truckways as a commercial opportunity, for either a state toll agency or a private consortium. This analysis calculated the internal rate of return (IRR) for a Truckway project on our 40,000-ADT Interstate, funded solely by toll revenues. Table 2 shows one of the many outputs of this analysis, which covered a wide range of scenarios. In this representative example, all eight scenarios had a positive IRR, though not all would be high enough to attract private-sector investors. All, however, would be suitable candidates for a state toll agency.

These results are fairly conservative, in that the analysis used only existing LCV configurations, ignoring the very real possibility that higher-capacity trucks would be developed and used in response to the availability of heavy-duty Truckways. And the highest toll level used in the Return-on-Investment (ROI) calculations was 80 cents/mi., even though in many cases a significantly higher toll would be implied by the rule-of-thumb that tolls could be charged up to one-half the level of cost savings provided. Had such toll levels been included in the analysis, the ROIs would have been significantly higher.

Political Feasibility of Toll Truckways

Historically, the trucking industry has opposed the expansion of tolled highways, on the grounds of "double taxation." In other words, heavy trucks already pay fuel (and other excise) taxes of around 16 cents/mi. (about 7 cents federal and 9 cents state/local). On existing toll roads, they pay a toll in addition to those taxes. Thus, trucks on toll roads "pay twice" in comparison to what they pay on non-tolled Interstates, which may be of more-or-less equivalent quality.

Our economic and financial analysis found that inter-city Truckways could be self-supporting from tolls alone. In other words, the construction and operation of these new lanes would not need to make use of the funds in the federal and

* The long double is not allowed in these states today under any conditions, but assuming it were, only a small fraction of its payload capacity could be used under the current 80,000 lb. gross weight limit. Hence, the 492 percent increase from the small amount it could legally carry in those states today should not really be surprising.

Table 2: Sample Toll Truckway Return-on-Investment Results (1 to 1 truck shift, 40,000 ADT, $2M/mi. capital cost)

Traffic	Toll = $0.40/mi	Toll = $0.80/mi.
25% trucks (1000)	4.12%	9.17%
50% trucks (2000)	8.85%	17.34%
75% trucks (3000)	13.04%	25.31%
100% trucks (4000)	16.97%	33.19%

state highway trust funds, whose source is the various highway user taxes. Thus, our recommendation is that trucks using these self-financing lanes not be charged fuel taxes for the miles driven on those lanes. This would eliminate the trucking industry's concern about double taxation, with respect to this new infrastructure. It would also undercut the railroad industry's argument that public funds should not be used to "subsidize" its long-haul trucking competition. LCVs operating on Toll Truckways would be analogous to freight trains operating on their own, self-supporting rail rights-of-way.

Thanks to today's nonstop electronic toll-collection technology, implementing this policy would be easy and inexpensive. The same system that did the electronic tolling would already be documenting the miles traveled by each truck on the Truckway. Based on the average fuel usage for particular size/weight classes, the system could calculate the fuel-tax rebate applicable to each trip. That information would be reported to state taxing authorities, who would issue periodic rebates to registered trucking companies that use the Truckway.

What effect would granting such rebates have on highway trust funds? First, we need to keep in mind that Truckways would only be implemented in corridors where there was heavy existing and future truck traffic, where over the 20-30 year planning period, there would likely be a need for additional lane capacity. (These are the routes most likely to yield a commercially viable ROI). Thus, a state DOT authorizing a Toll Truckway in a corridor would be obtaining needed new capacity without having to pay for either the capital costs or the operating and maintenance (O&M) costs. In addition, the more heavy truck traffic that shifts from existing lanes to the Truckway lanes, the greater the O&M savings to the state DOT for those regular lanes.

Our modeling results make it possible to quantify this impacts, as shown in Table 3. For the same set of scenarios as in Table 2, we compute the annual loss in fuel tax to the DOT and subtract from that its annual O&M savings. That produces the net cost to the DOT. But that number must be compared with the cost avoided by the DOT in not having to build, operate, and maintain the new truck lanes. As can be seen, that avoided cost is several times as much as the net cost of the rebates. Clearly, the DOT comes out ahead.

Needed Policy Changes

Toll Truckways could bring about dramatic improvements in highway safety and truck-shipping efficiency. But their implementation will require several key changes in existing federal highway policy. The 2003 reauthorization of the federal surface transportation program offers the first real opportunity to make these changes.

The first needed change is for the federal government to encourage states to make available right-of-way within existing inter-city highway corridors on the Interstate system and other routes in the National Network. No state would be required to do so, but it would become FHWA policy to encourage states to do so, and to set conditions that would facilitate consistent standards for Toll Truck-

Table 3: Annualized Impact on State DOT of Truckway Fuel-Tax Rebates ($ per lane-mile of Toll Truckway)

Truck % in Truckway	Truck ADT in Truckway	Fuel tax loss to DOT	O&M savings to DOT	Net cost to DOT	Avoided cost of new lane
25%	1000	$58,400	$6,090	$52,310	$352,428
50%	2000	$116,800	$13,298	$103,502	$366,250
75%	3000	$175,200	$37,558	$137,642	$381,478
100%	4000	$233,600	$47,101	$186,499	$389,788

ways nationwide.

Second, for any new lanes designated as Toll Truckways, the current LCV freeze on truck sizes and weights would be lifted. We suggest liberalized limits of 22,000 lbs. per single axle, 37,500 lbs. for tandem axles, and 53,000 lbs. for tridem axles; lengths to 108 feet; and height to 14 feet.

Third, the current prohibition on charging tolls on Interstates would not apply to Toll Truckways.

And fourth, trucks using Toll Truckways would be exempt from federal fuel taxes, and states agreeing to the implementation of such truckways would also be required to make similar arrangements for exemptions from state fuel taxes. Here again, this would not be a policy forced on states; it would simply be one of the conditions for being able to implement Toll Truckways on portions of the federal system in that state.

In addition to improving highway safety and increasing the productivity of trucking, the implementation of Toll Truckways would offer a number of other benefits. By making possible the transportation of more freight in fewer trucks, Truckways would reduce vehicle miles traveled, fuel consumption, and vehicle emissions. The new, heavy-duty lane capacity would also be valuable for emergency use in time of war, natural disaster, or terrorist attacks. And by making U.S. long-distance truck configurations more compatible with those of Canada and Mexico, Truckways would further the objectives of NAFTA.

Conclusion

By significantly increasing truck payload capacity, Toll Truckways would reduce the cost of shipping most U.S. freight, making better use of the nation's extensive highway network. By separating much heavy truck traffic from automobiles, Truckways would reduce the extent of car-truck collisions, thereby improving highway safety. By hauling more freight in fewer trucks, the Truckways would produce net environmental benefits. And by making use of toll financing, this important addition to the highway system could be accomplished at much less cost to highway trust funds than paying for the Truckways out of fuel tax revenues. The 2003 surface transportation reauthorization offers an opportunity to begin this 21st-century improvement of America's highway system.

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