Project # C-07-10

BRIDGE VEHICLE IMPACT ASSESSMENT

Task 7: Recommend General Bridge Hit Prevention

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None

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INTRODUCTION

Based on the detailed study carried out in this project, general recommendations for preventing bridge hits can be classified broadly into the following three categories:

- **Regulatory**: It has been observed from the analysis of bridge hits data in the New York State that a majority of multiple hits to bridges are caused by trucks on unauthorized roads, such as parkways and local roads restricted to truck traffic. Hence, regulatory measures can have significant effects on reduction of multiple hits to bridges by discouraging truck drivers from using parkways and other restricted highways.

- **Technological**: It has been observed from data collected by New York State Troopers that most of the drivers involved in bridge hits incidents on parkways were using consumer GPS system, which isn’t programmed to avoid parkways and low clearance bridges. Hence, technological solutions, such as Truck GPS system, smart phone apps and overheight detector systems can be very effective in warning drivers actively as they approach a low clearance bridge.

- **Education and Outreach**: Making truck drivers aware about consequences of driving on restricted highways and parkways through continuous educational outreach efforts, e.g., flyers, seminars, safety courses, etc., can be an effective tool for mitigating bridge hits. This helps in prevention by modifying truck driver’s behavior.

In addition to these measures, NYSDOT should also actively collaborate and coordinate with other state agencies such as motor vehicles services (MVS), other state DOTs such as Connecticut DOT (currently collects data) or initiatives such as I-95 Corridor to identify and implement effective measures.

DETAILED DESCRIPTION OF PROPOSED RECOMMENDATIONS

A detailed description of recommendations under above three categories is presented in the following.

REGULATORY RECOMMENDATIONS

Since a majority of bridge hits in New York State are because of unauthorized presence of trucks on parkways, regulatory recommendations may have impacts all over the state and may be the most cost-effective measures. Following regulatory recommendations are proposed to be further explored or implemented:

**Prohibiting Consumer GPS**: It has been observed from data collected by NY State Troopers that truck drivers frequently use consumer GPS system. These consumer GPS systems should be prohibited for use in trucks all across the state.

**Coordination with Local Authorities**: Several local routes under CSX bridges (e.g., routes under bridges hit frequently in Region 5) may not be restricted to trucks. NYSDOT, in collaboration with local authorities, should review all local routes with low height bridges to restrict such routes from truck traffic.
**Fines and Penalties:** It is noted that truck drivers pay minimal fines if they are caught on parkways or restricted highways. New York State Department of Transportation should explore the possibility of imposing stiff fines, points and penalties for unauthorized presence of trucks on parkways and restricted highways. This measure will create significant psychological barrier as well as awareness towards low clearance bridges. Implementation of this recommendation will have state-wide impacts.

**Additional Liability Insurance:** Requiring truck drivers with history of multiple violations or hits on bridges on unauthorized routes purchase additional liability insurance will increase the perception of trucking companies to the cost of violations. This can also be achieved by imposing significantly higher number of traffic violations points compared to other common moving traffic violations.

**Electronic Monitoring and Summons:** Using electronic remote monitoring to identify trucks on unauthorized routes (parkways, local roads) and issuing summons / penalties by mail will create a psychological barrier to using parkways and other unauthorized routes.

**Tests and Mandatory Education:** Including a section on “bridge strikes: its cause and consequences” in Commercial Driving License (CDL) tests will increase the awareness of truck drivers towards risks and consequences of driving on unauthorized routes. Requiring truck drivers undergo mandatory continuing education on various aspects of bridge hits will increase the awareness of truck drivers towards risks and consequences of driving on unauthorized routes.

**Amber Alert for Low Bridge Regions:** Similar to Amber Alert system for missing children, an alert system for low bridge region should be developed. This system can be designed to alert drivers about low vertical under-clearance bridge region and encourage them to report any truck on parkways to police. For this system, Signs have to be placed along parkways informing drivers about restrictions on truck traffic.

**TECHNOLOGICAL RECOMMENDATIONS**

The main goal of technological recommendations is to provide active routing and active warning to truck drivers who are already on unauthorized routes. Following technological recommendations are proposed to be implemented.

**Installation of Overheight Detection Systems:** It has been observed from results presented previously that a majority of bridge hits occur on low clearance bridges over parkways and local highways that are restricted to overheight trucks. It is possible that truck drivers aren’t aware of their height or believe that they will pass under the bridge without impacting it. Installing an overheight detector system on the ramp of parkways before a low clearance bridge will provide truck drivers an active warning based on the height of the truck and vertical under-clearance of trucks. This warning can be in the form of a digital warning sign or red light. These systems can also be programmed to automatically notify local law enforcement office about the possible impact to the bridge, if a truck driver doesn’t stop on the warning. It has been observed from the feedback of state DOTs using these systems that they are effective in reducing impacts to bridges.
through active intervention. Moreover, the presence of these systems on parkways also creates psychological barriers in the minds of truck drivers about using unauthorized parkways, thereby preventing future hits.

Several overheight detection systems have been identified through the detailed survey of several state DOTs using these systems. In particular, it has been observed that HISIC450 system manufactured by SICK MAIHAK, Inc. and Trigg detectors have been used by many state DOTs and have been found to be reliable. These systems have a service life of 15-20 years, require minimal maintenance and have an installation cost in the range of $15,000-$20,000 per unit (for a system with digital sign options). For parkways, simple systems with single direction detection, low speed, red/green light options can be configured at significantly lower costs. It should be noted that benefits derived by installing these systems far outweigh installation costs.

Truck escort area (parking area) should be provided after the OHDS system so that a truck driver can park the truck and call police for help.

NYCDOT has installed infrared sensors on Bronx River Parkway at Westchester Ave and has marked the pavement of the ramp to the parkway with “Cars Only”. Infrared sensors have been activated 9 times and there hasn’t been any incident since November 2010.

Google Maps: Many drivers rely on Google maps for routing their vehicles. Embedding vertical under-clearance information in these maps can be helpful in preventing the entry of trucks on parkways.

Transmission on CB Radio Transmitters: Truck drivers regularly use CB radio transmitters to communicate with each other. Transmitting information to truck drivers about low clearance bridge ahead through a CB radio transmitter may make the trucker driver aware about the risk. The cost of a CB radio transmitter with antenna is approximately $300 and it is effective in the range of approximately 15 miles. Hence, CB radio transmitters need to be setup near bridges that are being hit multiple times. Other issues related to costs are maintenance and regular broadcasting on CB radio. This process can be made automatic through a recorded message. Hence, this measure can be an extremely cost-effective approach to reduce impacts on bridges hit multiple times.

Truck GPS: With widespread availability of GPS systems for routing, it has been observed that many truck drivers end up on parkways because of the use of consumer GPS units. Since GPS units are being used more frequently because of their ability to reroute in real time, mandating the use of GPS units customized for trucks will have a significant contribution in reducing bridge hits. Several newer GPS units, e.g., Rand McNally TND 510 Truck GPS, have been designed and are being marketed for trucks. These GPS systems seem to consider truck characteristics into routing. Their maps have bridge under-clearances embedded. Hence, a route planned by these devices will automatically avoid routes with low under-clearance or restricted bridges. During telephone conversation with representative from Rand McNally, the PI was told that the device uses vertical under-clearance data posted at the NYSDOT website as it becomes updated.
NYSDOT should actively collaborate with these companies to ensure that these GPS systems do use most recent data on vertical under-clearances of bridges. Availability of a truck GPS system will be very effective in preventing bridge hits by (i) avoiding routes with low clearance bridges and (ii) providing real-time warning to truck drivers who are already on a route with low clearance bridges as truck approaches a low clearance bridge. The issue related to the use of the most recent vertical under-clearance information can be addressed by providing the vendor, such as Rand McNally, updated information regularly. New York State Department can also require truck drivers update their GPS unit while planning a route. In fact, the GPS device connected to wireless network through a cell phone can be programmed to automatically update as updated map becomes available.

It has been noted that a truck GPS system typically costs approximately $500. These systems also have routing based on the use of real-time traffic data. This feature may require additional monthly expense of approximately $20. This is quite cheap and cost-effective solution, given the risks and costs involved after a truck has impacted a bridge. New York State Department of Transportation should actively promote the use of GPS units customized for trucks through outreach to trucking companies.

**Smart Phone Apps**: A majority of smart phones have GPS capabilities. Hence, an App for smart phones can be developed to embed maps with low vertical clearances as an alternative to TRUCK GPS. Truck drivers can download the app directly from NYSDOT website. The app can have the ability to automatically update as new information on vertical under-clearance of bridges becomes available. However, this option will require significant funding to develop and maintain the app.

**Signage and Warnings**: Following measures on signage and warning should be adopted to increase driver awareness towards low-clearance bridges or restricted parkways.

- It has been observed that many regions, such as Regions 5 and 8, have inadequate signs warning truck drivers about a low vertical under-clearance bridge ahead. On the other hand, Region 10 of NYSDOT has well planned and sufficient number of signs. Although effectiveness of these signs in reducing hits on bridges isn’t clearly understood, their presence does help in drivers being aware about the risk of impacts.
  - NYSDOT should develop a comprehensive approach to evaluate signs near under-clearance bridges and install signs as per MUTCD.
  - Marking parkway entrance pavements with warning about low under-clearance bridges may deter truck drivers from proceeding further.
  - Many signed warning drivers about low vertical under-clearance may not be visible because of vegetations. Vegetation should be removed to ensure clear visibility of signs.
  - Warning signs should also be placed on both sides of roads (e.g., ramp of a parkway) approaching the bridge.
  - Larger and repeated signs should be placed along the route before the bridge.
- An alternate route sign should be provided before the driver enters the region of the low-clearance bridge so that a truck driver can safely exit before the bridge. If an exit is not available before the bridge, the driver should be provided instructions to wait on the shoulder of the route and then call for help.
- Recommended minimum distance for an advance warning sign placed before a low clearance bridge should be increased to provide the driver enough reaction time to make a decision.
- It has been noted that truck drivers sometimes ignore the low vertical under-clearance sign because they believe that the actual clearance is higher than the posted one. In New York State, for all bridges with vertical clearance of 14 feet or less, posted clearance is 12 inches (1 foot) less than the actual clearance. However, this practice makes truck drivers distrust posted clearances. Placing both legal and actual vertical under-clearance of the bridge will help drivers under the risks of hitting a bridge better while making a decision about stopping.

- It is likely that truck drivers may not be aware about the height of their cargo or may not be able to immediately correlate with under-clearance of the bridge in a short reaction time available. Hence, truck drivers should be required to post height of their truck / cargo in the cabin within their eyesight. They should also carry appropriate tools to measure height of the truck / cargo in case of changes in truck cargo.

**EDUCATION AND OUTREACH RECOMMENDATIONS**

Following education and outreach measures are recommended for reducing bridge hits:

**Bridge Strike Mitigation Website:** A website dedicated to the problem of bridge hits and possible solutions should be developed. Latest information on the issue of bridge hits can be posted on this website, including photographs of any recent bridge hits. The website can also be linked with similar sites by other agencies.

**Outreach with Motor Carrier Association:** Motor Carrier Associations coordinate with major trucking industries and can be very helpful, in outreaching the trucking industries to seek feedback about possible solutions.

**Outreach with Independent Operators:** While it may be easier to outreach truck companies with fleet, it has been observed from data collected by the New York State Troopers that independent operators are frequently involved in bridge hits. Hence, NYSDOT should develop an approach for outreaching independent operators.

**CDL Tests:** Including a section on “bridge Hits: its cause and consequences” in Commercial Driving License (CDL) tests for both new and renewal CDL licenses can have significant long-term impacts. This section can include statistical information from this study, consequences of being on an unauthorized highway, consequences of using consumer GPS, etc. This report or a condensed version of this report can be made available as a study guide for such tests.
**Educational Materials:** Educational materials, such as posters, handouts and other materials illustrating severity and consequences of bridge strikes should be made available to local trucking companies and out of state trucking companies requesting permit. These materials should illustrate:

- Photographs of trucks hitting bridges
- Photographs of traffic congestion caused because of bridge hits
- Statistical data on bridge hits, including an estimate of damages caused.

**Newsletters:** Including data on bridge hits in regular NYSDOT newsletter and distributing to local trucking companies in New York State or to out of state companies requesting permits will keep them aware about the issues.

**Seminars:** Organizing a series of seminars on bridge hits mitigation and requiring/encouraging trucking agencies and drivers attend these seminars will keep them aware about the problem.

**Outreaching Driving Schools:** Outreaching trucking driving schools and requesting/requiring them to include a module on “Bridge Hits: Its Causes and Consequences” in driver education curriculum will help in making future drivers aware of the issue.

**Annual Safety Course:** Requiring truck drivers undergo an annual safety course that includes a detailed module on “Bridge Hits: Its Causes and Consequences” will help them understand the bridge hits problem and factors responsible for it.

The cost of developing education/outreach materials is minimal, since a majority of required information is available in the final report of this project. The cost of implementing proposed education/outreach activities is also minimal if the safety seminar is conducted by the NYSDOT engineer at a desired interval. A majority of “Education and Outreach Recommendations” can be implemented as a part of various existing programs.

**CONCLUSIONS**

This task report presents three categories of general recommendations for reducing hits on bridges in New York State. These recommendation categories are: Regulatory, Technological and Educational / Outreach. Several recommendations under each of these categories are presented and their costs implications are discussed. It should be noted that while both regulatory and education/outreach recommendations are likely to have impacts over the entire New York State region, implementation of technological recommendation, except for Truck GPS, is more suitable for reduction of bridge hits to a specific bridge. Truck GPS, if implemented successfully, will have significant impact on the reduction of bridge hits because of its ability of real-time routing and active warning.