Risk Management of Public Transportation Systems in North America

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Abstract: Around the world, governments at all levels play very important roles in managing the safety of public transportation systems. Only in North America, however, do market forces (i.e., insurance and finance) play a bigger role than the public sector in both the construction and operation of public transportation systems. Here, risk management has a special meaning in both financial and legal terms. Public transportation “properties” work closely with government sponsors, insurance brokers, underwriters, and claim administrators in both managing and financing the risks. This long process involves the development of safety plans, standard compliance training, accident review, hazard analysis, risk mitigation, and legal action. Government regulation and insurance policy should be seen as two parallel tracks that together guide the safety improvement programs in rail and transit systems.

Key Words: public transportation, risk management, insurance, system safety process, government regulation, safety standards.

1. Introduction

In North America, risk management has its primary impact in business and finance whereby it focuses on risks that can be managed using traded financial instruments or insurance. American public transportation has its tradition in managing risks stemming from physical or legal causes (e.g. natural disasters or fires, accidents, death, and lawsuits). Although they are primarily financed by public agencies, public transportation systems are operated in part like a private enterprise in North America. Transit properties, and their associated stakeholders and contractors, have the option to use public and private insurance programs to manage risks. Federal, state and local governments, private contractors, and financial institutes all participate in the risk management to protect the public investment and to improve the safety standard of public transportation systems.

This paper sets risk management into a business process for public transportation. System safety planning, hazard analysis, and risk mitigation are business tools for risk managers today. The public-private-partnership (PPP) is one of the ways to promote new technologies and to develop new safety standards in public transportation.

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This paper describes the complex structure of the public transportation system in North America, providing context for the reader to understand why a cooperative approach to safety is better here. This paper uses Boston (Massachusetts), Houston (Texas), and Toronto (Canada) to illustrate the diversity of risk management in public transportation.

2. The Structure of Public Transportation Systems

Transportation is often divided by modes such as surface transportation, waterways and aviation. Because private enterprises own all commercial airlines in North America, the government’s role in aviation is limited to the airport, air traffic control, and communication and navigation systems. According to the American Public Transportation Association (APTA), public transit transportation is primarily defined as a combination of bus and rail (light and heavy) systems. Rail transit is also called mass transit or rapid transit. From this, bus rapid transit (BRT) and personal rapid transit (PRT) have been introduced. For example, the “Silver Line” in Boston is an extension to the subway system but it runs specially designed buses or “trains” over the road and through underground tunnels. PRT includes the “Dial-a-Ride” service that goes door-to-door like a taxi for elderly and disabled people. It is important to note that this service is required under law by the American with Disabilities Act (ADA) [1] of 1990.

U.S. federal government, through the Federal Railroad Administration (FRA) and the Federal Transit Administration (FTA), introduces safety standards, and health and environmental regulations. State governments, through their respective DOTs, help the federal government monitor and enforce the rules on passenger transportation systems. Transit authorities are organizations created or sponsored by public finances, and are responsible in part for the planning, construction, operation, maintenance, and business development in public transportation. One or many of these functions can be conducted by government employees or by contractors from a private firm [2].

Local and state governments encourage several innovations, including shared-use and shared-ownership of private cars, creation and use of high-occupancy-vehicle (HOV) lanes and handy parking spaces at transit stations for car-pool cars and zip-cars1. People show their support for these innovations by using public transportation more and by driving their own cars less. Therefore, the concept of public transportation is extended from the physical vehicle and infrastructure to contractual arrangements and financial incentives. As the citizens participate in public transportation as riders, tax-payers, and voters, public opinion is very important to the development of public transportation in North America.

Many transit properties reported that small car/van service like Dial-a-Ride presented a higher level of per-passenger risk than bus and rail transportation. Risks and potential liabilities are the main reasons for some small cities to contract the required services to private companies or not start them at the first place. Large cities have reported an increase of complaint and lawsuit by the riders of door-to-door special service, van-pool and personal rapid transit services. For the same reason, most school bus services are operated by private companies [3].

1 ZipCar ™ is a new concept of transportation originated in Europe that members of this club use the company’s car by the hour instead of owning vehicles. Is this a business model for developing countries?
The spirit of public transportation in North America relies on public assistance, public participation, and the work done by non-profit organizations in transportation; it does not solely rest with the owner of the transportation assets. In some large metropolitan areas, public assistance is no longer limited to financial and risk management. The government’s support to public transportation also includes the development of regulations and legislative programs. On the shared-use of railroad tracks or corridors, local government often signs legal agreements that indemnify railroad owners from some types of accident. State government provides insurance programs to transit properties in financing the risk and protecting the public interests [4]. In the last five years, new ideas on public-private partnership (PPP) have furthered the concept of public transportation. Metropolitan planning organizations and private enterprises introduced many innovative ways to promote public transportation, aiming to both encourage the public to “leaving

Table 1: The Classification of Public Transportation

<table>
<thead>
<tr>
<th>Mode</th>
<th>Purpose</th>
<th>Examples</th>
<th>Funding</th>
<th>Oversight</th>
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</thead>
<tbody>
<tr>
<td>Railroad</td>
<td>National &amp; inter-state rail</td>
<td>AMTRAK</td>
<td>Congress, USDOT/FRA</td>
<td>FRA</td>
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<td></td>
<td>High-speed rail</td>
<td>AMTRAK, NEC</td>
<td>Congress, USDOT/FRA</td>
<td>FRA</td>
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<tr>
<td></td>
<td>Regional &amp; inter-city rail</td>
<td>UPRR</td>
<td>Private railroads</td>
<td>FRA, FTA</td>
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<tr>
<td></td>
<td>Intra-city &amp; commuter rail</td>
<td>MBTA</td>
<td>State &amp; local governments</td>
<td>FRA, FTA, States</td>
</tr>
<tr>
<td>Transit Rail</td>
<td>Light rail</td>
<td>Metrolink</td>
<td>State &amp; local governments</td>
<td>FRA, FTA, States</td>
</tr>
<tr>
<td></td>
<td>Subway</td>
<td>Metro, T</td>
<td>State or local governments or private contractors</td>
<td>State, FTA, MTA</td>
</tr>
<tr>
<td></td>
<td>Monorail</td>
<td>Las Vegas Monorail</td>
<td>State or local governments or private contractors</td>
<td>City, FTA</td>
</tr>
<tr>
<td>Bus</td>
<td>Transit Bus</td>
<td>MBTA</td>
<td>State or local governments or private contractors</td>
<td>State, MTA, County, City</td>
</tr>
<tr>
<td></td>
<td>Rapid Bus Transit</td>
<td>MBTA, Silver Line</td>
<td>State or local governments or private contractors</td>
<td>State, MTA, County, City</td>
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<td></td>
<td>Shuttle Bus</td>
<td>Airport Express</td>
<td>State or local governments or private contractors</td>
<td>Special Authority</td>
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<tr>
<td></td>
<td>School Bus</td>
<td>Yellow Bus</td>
<td>Local school district or private contractors</td>
<td>State DOE, City</td>
</tr>
<tr>
<td>Car/Van</td>
<td>Door-to-Door Mini-Bus</td>
<td>Dial-a-Ride</td>
<td>State or local governments or private contractors</td>
<td>State, MTA, County, City</td>
</tr>
<tr>
<td></td>
<td>Small School Bus/Special Education Bus</td>
<td>Mini-Van, Private Car</td>
<td>Local school district or private contractors</td>
<td>State DOE, City</td>
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<tr>
<td></td>
<td>Shared-Ride Car</td>
<td>CarPool Service</td>
<td>State or local governments or private contractors</td>
<td>State, MPO, County</td>
</tr>
<tr>
<td></td>
<td>Shared-Use Car</td>
<td>ZipCar, FlexiCar</td>
<td>Private business &amp; local government provides parking spaces/other incentives</td>
<td>Private Business</td>
</tr>
<tr>
<td>Other</td>
<td>Waterway Transportatio n</td>
<td>Ferry</td>
<td>State or local governments or private contractors</td>
<td>State, MTA, USCG</td>
</tr>
</tbody>
</table>
your car at home” and “do not own a car if you don’t have to.” Operation LifeSaver\(^2\) is a volunteer organization supported by all levels of government and local businesses for safety education on highway-rail grade crossings that showed a great impact in the recent years.

Governments that have different roles and responsibilities with regard to public transportation systems may have different approaches toward risk management. For a system that is mostly owned by the public sector, the operator is usually protected by government regulations and state-run insurance programs. For high-speed rail (HSR) and Magnetic Levitation (Maglev) systems, the federal government agrees to accept the higher level of inherent risk that comes with higher speeds [5]. However, FRA requires the suppliers to make changes to the system for the US. Such changes included equipment and right-of-way designs, and maintenance, inspection and training procedures with the human element taken into account. All changes are oriented towards ensuring a system that actually has enhanced safety levels over the base case [6].

3. The Development of Safety Standards

Since 1984, significant changes have taken place in the rail passenger industry: many new commuter railroads started operation, both freight and passenger rail traffic increased, rail technology greatly advanced, and lighter and faster equipment became available. Furthermore, High-Speed-Rail projects were proposed, and the Acela Express train (America’s High-Speed-Rail) started to operate between Boston-New York-Washington DC (the Northeast Corridor) at 150 miles per hour. Other technological advances such as wireless telecommunication and global positioning systems (GPS) have been implemented in transportation systems [7]. These changes made it difficult for the industry to maintain its excellent safety record by continuing to rely on outdated standards.


This led to a revolutionary practice of system safety in transportation systems, including the preparation of the System Safety Program Plan for intercity and commuter rail services. In 1996, FRA issued Emergency Order No. 20, requiring enhanced operating rules and plans for ensuring the safety of passengers occupying the leading car of a train. Since then all passenger railroads began to include the system safety plan as a part of their standard operating practice. In the 1990s, the Volpe Center conducted a series of preliminary risk analyses on high-speed guided transportation systems for FRA and Hazard Analysis Guidelines for Transit Projects for FTA. Procedure-wise, passenger rail systems followed these analytical tools to analyze the risks: preliminary hazard analysis, failure modes and effects analysis, and operating hazard analysis. The word

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\(^2\) Operation LifeSaver is a grass-root organization supported by volunteers, rail operators and the government at all levels. See more information at: [http://www.OLI.org](http://www.OLI.org)
“preliminary” is important to these organizations because it gives them enough flexibility to take (or not take) any mitigation actions until further analysis is done.

In 1995, FTA published the final rule on “Rail Fixed Guideway Systems; State Safety Oversight” that requires the state governments to help in monitoring the safety and security of transit systems within their states, subsequently referred to as the State Safety Oversight Rule or 49 CFR Part 659. Under that rule, the transit properties are required to:

- Develop a System Safety Program Standard;
- Require, review and approve, and monitor the implementation of a System Safety Program Plan and Security Plan that complies with the Oversight Agency’s Program Standard at each rail transit system;
- Require each rail transit system to report the occurrence of accidents and unacceptable hazardous conditions within a period of time specified by the Oversight Agency;
- Require the rail transit system to implement a Corrective Action Plan;
- Conduct on-site visits at each rail transit system at a minimum of every 3 years to perform a formal Safety Review;
- Require the rail transit system to conduct safety audits according to the Internal Safety Audit Process detailed in the American Public Transit Associations Manual;
- Report accidents to FTA and put data into National Transit Database (NTD).

Before 1999, the safety of passenger rail equipment was dependent in large part on voluntary compliance with AAR’s “Manual of Standards and Recommended Practices for Passenger Cars” - last updated in 1984, and the railroads' ability to adapt freight car safety standards to the inspection and maintenance of passenger cars. There were no specific standards on passenger rail equipment, except some guidelines and emergency orders issued by FRA. Because of the resurgence of commuter rail services, U.S. Congress recognized these needs and mandated that FRA develop a set of comprehensive safety standards that specifically address rail passenger equipment through the Federal Railroad Safety Authorization Act of 1994. As part of this Act, Congress granted FRA an important new tool to directly seek advice and input from the industry during the development of the new safety regulations [8].

The Railroad Safety Advisory Committee (RSAC) was established in 1996 to address the need for a more cooperative approach to FRA rulemaking. It is composed of representatives from all facets of the railroad industry, from railroads to labor to industry associations. FRA recognized that the Code of Federal Regulations (CFR) could be less complex and less onerous if the industry updated and maintained its own safety standards for rail passenger equipment [9]. FRA approached APTA to take on the responsibility to update, improve and maintain industry safety standards. APTA agreed and formed the Passenger Rail Equipment Safety Standards (PRESS) Task Force to do so. In 1999, FRA issued the final rule on 49 CFR Part 238, Passenger Equipment Safety Standards and at the same time APTA published its “Manual of Standards and Recommended Practices for Rail Passenger Equipment.”

In 2000, FRA issued the Notice of Proposed Rulemaking (NPRM) on Performance-Based Safety Standards (49 CFR Part 236 Subpart H) on Computer and Processor-Based Signal and Train Control Systems. Five years later, FRA issued this final rule and began a new era of risk assessment in the application of new technology within the railroad
industry. The government defined only in principle the objectives and procedures for safety analysis on processor-based new systems. It should be noted that the FRA’s signaling regulations contained in part 236, subparts A through G, applied mostly to traditional electromechanical relay-based systems, and were viewed as “prescriptive” by the industry. In developing subpart H, then, it was decided by the RSAC group to develop “performance based” regulations for processor-based systems. It was perceived that a “performance” approach would allow non-traditional technologies to be used if proven to be as safe as or safer than traditional ones.

The standard requires the industry to choose a methodology and prove that the new system is at least as safe as the existing system. FRA, however, has the right to validate and verify the industry’s submissions, as well as to agree or disagree with the proposed risk assessment methodology. FRA does not certify or provide any guarantees on rail safety; it simply allows the system to operate with conditions, then inspect and report railroad’s safety records. For large systems such as Positive Train Control (PTC), the government may provide technical and financial support to its research and development, including safety case analysis. FRA intends to deal with the new signal and train control systems on a case-by-case basis. The railroad needs to file a petition for a waiver from the existing rules, so that it can accumulate testing and operating experiences (and data) on the new system. FRA will then be able to measure the system’s performance according to the proposed and approved Product Safety Plan (PSP) of the supplier and the Railroad Safety Program Plan (RSPP).

Due to the complexity of new systems, the railroads are gradually relying on system suppliers to provide safety guarantees. In order to provide the extended warranty, the system developers must test their systems and document their safety records. Through contractual agreement and insurance protection, the railroad owners and operators have transferred some of the safety functions to their suppliers and system developers. Railroad suppliers are now playing a more active role in safety standard development, as at times they are the only ones who know how their systems work. The convergence of new technologies will likely increase the roles of industry in system safety.

4. The Meaning of Risk Management

Like any other business, transit properties first saw risk management as a tool to put their financial losses under control. Later they started to develop business processes around risk management, which could include policy procedures and organizational supports on planning, operations and safety. If from the financial services department, the risk manager is more likely to support the establishment of policy policies on insurance programs. To the operations department, the risk manager is more likely to support the compliance of safety programs including accident investigation and return-to-work training. To the business development and planning departments, the risk manager is often in charge of the evaluation of a proposed system or project, therefore, the return of investment and value-at-risk are also part of a risk assessment.

In North America, most of the transit properties have adopted a corporate structure. To the board of directors or stakeholders committee, risk management is seen as a corporate services function with the following nine responsibilities: 1) Development of corporate policy on safety; 2) Administration of insurance programs; 3) Investigation of accidents; 4) Legal service on insurance claims and law suits; 5) Administration of worker’s compensation and extended medical insurance; 6) Management of public
In general, a risk management process addresses the following issues:

- **Vehicle-related accidents**: Accidents on the road or track are rare events, but catastrophic accidents do not only cause damage to people and properties, but also influence public opinion on public transportation.
- **Employee health and safety**: Employee’s health is an important key to the safety of transit systems. In addition to health insurance, the employees are provided with worker’s compensation and life insurance programs.
- **Passenger health and safety**: Transit systems must provide a safe and healthy environment to the passengers. From stop signs to clean air, the transit operators need to be compliant with all safety regulations.
- **Damage to transit properties**: The damage is not only limited to vehicles but also to station or terminal facilities.
- **Workshop and facility accidents**: Maintenance facilities also present hazards that could cause serious injury and fatality to employees.
- **Occupational health and operator egress**: Employees are trained to prevent repeated or prolonged movements.
- **Natural disasters and terrorism**: All transit properties are required to develop Emergency Preparedness Plans. Some of them added additional insurance on terrorism related accidents.

As noted in the previous section, in 1996 after several serious commuter train accidents, FRA issued an Emergency Order Number 20 (EO-20) in 1997 on “Commuter and Intercity Passenger Railroads, Including Public Authorities Providing Passenger Service, and Affected Freight Railroads,” which required each commuter train operator to develop a System Safety Program Plan (SSPP). Since then, some passenger rail operators have identified MIL-STD-822 as the starting point to conduct their risk assessments, and incorporated its safety polices as a part of the core/corporate policy. Gradually risk management is becoming a process running through “Safety Assurance/Compliance Training” and “Accident Investigation and Performance Review” in passenger rail operations.

Fig. 1. System Safety Process proposed by FAA’s Office of System Safety
In 1999, Federal Aviation Administration (FAA) further established the “System Safety” process by issuing the Safety Risk Management Order, 8040.4 and creating the “Office of System Safety” to develop as well as monitor the practice of system safety. Later in 2000 they published the System Safety Handbook: Practices and Guidelines for Conducting System Safety Engineering and Management. Every year, this office organizes the Annual Workshop on Risk Analysis and Safety Performance Measurements in Aviation [10]. Most transit properties have adopted a similar approach toward “the practice of system safety.” In other words, they are working to develop a Safety Management System (SMS) within their organizations.

To study the risk of implementing PTC in US railroads, the Volpe Center followed this system safety process to develop the Corridor Risk Assessment Model (CRAM) and the Territory Risk Assessment (RISK2) Model. These models establish the base case or baseline risk level for each signal or train control territory, including train speed, traffic density and operating condition [11]. This process was used to first defined the objectives of the proposed PTC systems, and then specify the levels of functions that are required to prevent certain types of railroad accidents.

Experts from government and industry formed an Accident Review Team (ART). This team then sat together at meetings and worked with an online application to understand past railroad accidents. They identified what types of accidents are PTC preventable (or to be classified as PTC Preventable Accidents/PPA) by 1-to-4 levels. The higher the PTC level required, the more investment is needed. The CRAM assisted the government in ranking the safety performance of railroad mainline corridors; the RISK2 model provided the industry with the current level of risk by railroad territory for each type of signal or train control system. These average territory risks are measured by the total cost of PPA per train-mile for freight operations, and by the PPA cost per passenger-mile for passenger operations. When introducing a new system, the industry needs to conduct a Base Case Risk Assessment of the system for initial trial segments or for the entire territory. The projected risk for PTC in dark (non-signaled) territory must be lower than a basic signaled (automatic block system) territory. The safety case usually includes more detailed computer-aided models for fault tree analysis, event tree analysis, probabilistic risk assessment, geospatial information systems, and other data display modules, illustrated in Figure 2.

In almost all risk assessments, the government requires a risk matrix to measure the likelihood (frequency or probability) and severity (consequence) of the system. Unlike the
DOD’s chart, the Risk Assessment Matrix proposed by FAA is much simpler for transportation agencies. No specific risk priority numbers or indices are required in Figure 3. A transit property could develop its own probability and severity classes to match one specific target on safety and system performance. They could also develop multiple matrices for subsystems, components and critical areas. To separate the risk assessment from the investment analysis, this improved risk matrix can support the safety improvement plans that should address all areas with “high” and “serious” risks. See Figure 3.

5. Insurance Programs

Many risk managers see insurance programs as a “means to an end.” To minimize their financial losses at the end, transit properties often start their planning work by searching for very specific insurance programs. Through risk assessment the managers obtain information about the safety performance and the risk exposed to the organization. Finally, the managers have to decide on the cost of the premiums for the insurance programs in order to protect the organization from further financial losses. In general, a transit authority has to have the following insurance programs:

- Worker’s Compensation program or a combination of life insurance and health insurance provided to its employees;
- Property Insurance that covers the damage of a vehicle or a facility;
- Third Party Accident (TPA) Insurance that covers the damage to other vehicles or properties or people;
- Excess Insurance that covers the catastrophic but rare event caused by nature or by terrorists.

If the transit system is operated by a public agency, its public employees can participate in the public insurance programs offered by the public organizations such as the state government’s worker’s pension funds and life insurance programs. Some state governments provide the transit properties with extended property insurance on vehicles
and buildings. If the transit system is contracted out to private companies, they may choose the private insurance plans to cover all or a part of their insurance needs. In general there are five types of insurance for transit properties:

- Self-Insured and/or administered programs;
- Participation in state/local government’s insurance programs;
- TPA (Third-Party Accidents or Third-Party Administered) insurance programs;
- CGL (Commercial or Comprehensive General Liability) insurance programs provided by private insurance companies or by the states;
- OCIP (Owner-Controlled Insurance Programs), similar to Self-Insured Program but it has a limited timeframe or scope. It is often used for construction and testing projects.

One transit property may have multiple insurance programs for different parts of its property or one for third parties involved in accidents and one for worker’s compensation. On insurance program administration, there is a trend to select a commercial brokerage firm for a five-year (or 3-year plus 2-year extension) contract in policy development and/or insurance underwriting/rewriting. Because major Class I railroads are self-insured in North America, commercial insurance coverage for light rail is only available through these five insurance companies: AIG, Arch, Chubb, Lloyds and Zurich (international firms) [12]. Under the Terrorism Risk Insurance Act (TRIA) of 2002, some transit properties could pay a special low-premium coverage through 1st Property Insurance under a three-year federal program that backs up insurance companies and guarantees that certain terrorist-related claims will be paid.

Houston METRO is the newest light rail project in North America, going into revenue service in 2004. Metropolitan Transit Authority of Harris County, Texas used an OCIP to cover the 4-years construction and testing of this project. They enrolled 268 contractors and received 283 General Liability claims, 139 Worker’s Compensation claims, 14 Builder’s Risk claims and 1 Professional Liability claim. Politically Houston METRO faced a challenge during the construction because one contractor died (builder’s vehicle accident). In the first year of operation, there was one major rail car accident and many small motor vehicle accidents at grade crossing. The city’s mayor was voted out of office before the system went into revenue service. However, financially this insurance program is seen as a successful “fast-track” program for other LRT projects to follow. Its insurance cost including the claims paid is under 3% of the project cost (the project has a total of $325 million).

6. Emerging Issues and Challenges

Currently FTA reiterated its Transit Safety Priorities as: 1) promote a system approach to safety (SSPP, hazard management process, state oversight reviews and audits, corrective action plans), 2) share best practices and tools (i.e., drug & alcohol program guide and training, transit safety website and safety technical assistance), 3) target initiatives based on data analyses (i.e., Drug & Alcohol MIS, NTD safety statistics and Triennial review data), and 4) insure compliance with safety regulations (i.e., drug & alcohol testing compliance and state safety oversight – new rule effective May 31, 2005 on 49 CFR 659 and Updates to 1996 SSO Rules).
Both for the industry at large and for APTA members, the safety culture at transit properties is changing from conformance of standard codes to a practice of System Safety. Policies and organizational functions are established to manage the risks from all levels [13]. A System Safety Program Plan (SSPP) is developed as a part of the business process. Safety Management Systems are developed to record and analyze all job-related hazards and accident data. Employees are encouraged to report under anonymity about “close calls,” “near mishaps,” or minor safety hazards. Over time, the industry will be able to self-measure and self-regulate their performances in safety assurance programs.

6.1. New Technologies in Public Transportation

The development of telecommunication and geospatial technologies has added new tools for use by public transportation. Global Positioning System (GPS) enables the dispatcher to know a bus’s location in real time. Closed-Circuit Television (CCTV) systems are now on board the buses recording or sending data to a central office through a wireless communication system. Therefore, the response to an emergency or an accident is handled in a more-timely manner. The video data has been used in accident investigation and claim processing. In many cases, these new technologies were very helpful in identifying fraudulent claims. However, they were also used in some court cases against the transit operators for their poor performance and forced the authority to pay large sums in compensation.


Traditionally the risk of a public transportation system is measured by its infrastructure or asset, when a major capital investment project is under consideration. Freight railroads in the U.S. have agreed to measure their safety records on total accident costs per train-mile they run within a year. In the past 20 years, aviation and transit systems have introduced the equivalent fatality rate per flight-hour or operation-mile. Many transit properties are used to assessing their risks on the operation-based models, which are in-line with insurance underwriters’ methodologies. However, this does not encourage the operators to increase their capacity or improve their ridership.

The high-level performance-based safety standard strayed from the prescribed government regulations. Instead, it follows the performance engineering principles by setting the target on performance for safety, capacity and efficiency. This may allow for risk relocation or distribution, ensuring the system achieves better performance. It is up to the industry to: 1) document all the hazards, 2) quantitatively assess the risks; 3) develop mitigation alternatives; and 4) prove their new systems are made safer than the old ones. This “risk-informed” approach will help the new systems to be safer than their predecessors.

6.3. Sharing Freight and Passenger Rail Infrastructure

In North America, the majority of rail tracks are owned and operated by freight-orientated railroad companies (railroads). In the past decade, the business of freight rail transportation had grown significantly, while the number of Class-I railroad companies was reduced from 10 to 6. The railroads increased the use of small/branch lines to deliver containers, automobiles, and hazardous materials to the large cities and major seaports. The mainline rail corridors have reached their designed capacities, thus the railroads are redesigning their rail networks, including the applications of PTC in both signaled and non-signaled (dark) territories. In this context, railroads are planning to increase the
number and size of freight trains both on the tracks they own and possibly on passenger rail tracks.

Following the success of New Jersey Transit and San Diego MTA, some new transit authorities are planning to run passenger trains on freight rail tracks. The main obstacle of these “Shared-Use” railroad tracks or rights of way (ROW) is the risk management, as a freight train is much heavier than a commuter rail train or a transit train. The passenger railcars, especially those pushed by a locomotive at the end, require a different crash energy management (CEM) system from the freight railcars and freight locomotives.

6.4. Outsourcing Risk Management

Some transit properties are seeking commercial brokers for a part of its insurance program such as legal services or claim processing, just as some properties may “outsource” the safety programs to consulting companies. Chicago Transit Authority (CTA)’s “Destination Safety” is a risk management program involving DuPont Safety Resources as a partner – teaming with the private sector on safety training and accident review.

In Canada, GO-Transit (Greater Toronto Transit Authority) is a government agency owned by the Crown. The Province of Ontario owns so much property it would not be cost effective to attempt to buy physical damage coverage for it all [14]. Therefore, GO-Transit does not buy physical damage coverage on its rail or bus rolling stock. They participate in the government sponsored Comprehensive General Liability (CGL) program because they get huge savings by being part of the larger group. That policy carries a $5 million deductible, which is shared by all participating members through their annual premiums and is subsidized by the Province. On the other hand, GO-Transit is operating very much like a business enterprise, and it has a multitude of policies/procedures including comprehensive system safety and corporate manuals that cover potential risks and due diligence practices. On TPA insurance, GO-Transit went through a competitive process to select qualified insurance brokers to purchase insurance programs and contract the private firms to administrate claims and compensation programs.

In 2004 Insurance Survey of APTA members, multimodal and rail systems showed 25% premium increase from 2003 on 3rd Party Liability Insurance. The property/casualty (P/C) ratio was 98% in 2004 from private carriers (down from the highest point at 116% in 2001). About 40% of these properties paid terrorism (TRIA) coverage on 1st Party Property Insurance (building and contents). The competition in the Casualty Reinsurance market has focused primarily on price in 2004 (down 10-15% from 2003). From an insurance point of view, the growth of (risk) exposures in 2005 will continue to accelerate, far outpacing inflation and the ability of today’s insurers to fund them.

The demutualization3 of insurance companies around the world has led to further industry consolidation. Only state-run insurance programs can compete in the insurance market, and provide affordable coverage to public transportation. By outsourcing some of the risk management tasks, many transit properties have reduced the cost of insurance programs. Measuring safety by performance has become a standard method in transit system planning and operation. They are actively involved in examining their business processes to meet the requirements of performance-based new rules.

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3 Demutualization in the insurance industry is the process whereby regulated mutual life companies are converted to stock companies. Demutualization enhances a company’s ability to access capital, increase the size of their markets and offer a wider range of financial services and products.
7. Conclusions

Public transportation grows in North America in many different ways. Both public and private sectors play some essential roles in constructing and operating the public transportation systems. Market forces including insurance companies are very successful in managing risks that are associated with property damages and casualties. Many transit properties see risk management as a part of their business processes, which they analyze market performance, and calculate in detail the costs of insurance coverage and potential liabilities. For public transportation, the goal of risk management is to minimize its financial loss and balance its annual budget. Contracting private companies to operate public transportation system is one of the good ways to manage government’s risk. The Owner-Controlled Insurance Program and Third Party Administered management process are proven effective for large system developments. After the industry and government agree on safety performance goals, the management companies are left alone to decide on the best policies and procedures of running the systems. After all, it is the transit property’s responsibility to ensure the safety of its passengers.

North America presents the latest development in system safety analysis techniques. Probabilistic risk assessment is rooted in geospatial information systems for public transportation systems. Government and industry developed the performance-based safety standards for public transportation systems. Federal government supported the legislations that limit the liabilities of transit properties, and at the same time it encouraged the industry to adopt new technologies to improve the system’s reliability and safety. A recent trend in risk management showed that transit properties could save money by out-sourcing part of the risk management function to private sectors or to a public-private partnership (PPP). Some transit properties are extending the scope of risk management from risk mitigation to safety system engineering. Thereby computer-aided tools and enterprise-wide Safety Management Systems (SMS) are developed to support the Performability Engineering process. Only with a safety system, could the public transportation be managed for its reliability, availability, maintainability and safety with the best lifecycle system performance.

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