FTA RESEARCH
FEDERAL TRANSIT ADMINISTRATION

REPORT SUMMARY

Preparedness and Catastrophic Event Management for the Washington, D.C. Metropolitan Area

Background

The devastating effects of terrorism are distinctly clear and realistic to our generation with the haunting September 11 attacks, the 2005 subway bombings in London, the 2009 attempted Christmas attack, and constant turmoil overseas. Therefore, it is important to examine and assess the outcome of potential terrorist attacks in preparation for an emergency evacuation by minimizing damages and enhancing solutions for the safety of the public. Most specifically, there is a need to investigate the ways in which a terrorist attack could affect a transportation network in densely populated areas and develop efficient emergency evacuation plans. Between 2007 and 2010, Florida Atlantic University's Transportation Research Group developed several emergency management scenarios involving immediate aftermaths of terrorist attacks in Washington, D.C. This project is an accumulation of three separate case studies conducted in the Washington, D.C. downtown area with varying degrees of specification.

Objectives

The purpose of this research was to examine and assess the existing infrastructure's ability to handle specified disasters and make recommendations based upon the findings of this research.

Case Study 1 applied a series of evacuation techniques for an efficiency comparison (generation, implementation, and comparison for analysis). Techniques included staged evacuation, police-assisted contraflow, and public transit priority lanes. Multiple combinations of these evacuation techniques were used to provide more information regarding the potential benefits of evacuation strategies.

Case Study 2 evaluated different evacuation procedures for special needs populations from large urban areas using current public transit systems. A hybrid micro-mesoscopic simulation model was constructed to investigate real-life scenarios for evacuation methodologies, including a microscopic model of the core area of the network and a mesoscopic model of the outer region. A linear programming optimization model was developed to find the optimum locations for evacuation bus stops. The results of this aspect of the study identified specific bus stops for emergency evacuation of special needs populations and the associated bus routes to safe zones.

Case Study 3 explored the feasibility of the use of transit signal priority (TSP) during a mass evacuation where police assistance is unavailable. A major assumption of this case study is that public transit services used in this emergency evacuation scenario are operated by trained emergency response professionals wearing protective gear.

Findings and Conclusions

The results of Case Study 1 found that the majority (63–65%) of able people within the impact area with no access to a personal vehicle will walk to a safe destination, another 20–22% will attempt to drive, and the remaining 15–17% will rely on emergency evacuation buses to a safe area. The total evacuation time found through the simulation model is approximately one hour to evacuate persons who choose to drive, walk, or take the emergency evacuation buses.

Case Study 2 effectively addressed the optimal allocation of bus stops for the purpose of evacuating special needs populations. The use of a linear programming technique for the mathematical model presented in this research yielded satisfactory results. The 40-bus-stop scenario would not be ideal to implement for evacuation purposes for the case study. Each bus stop scenario that contained more than 40 bus stop locations showed a superior performance.

The results of Case Study 3 found that it would take four non-prioritized transit units to accomplish the same task as three prioritized vehicles. Furthermore, allowing TSP during an urban evacuation has little to no effect on evacuation clearance time or evacuee travel time. Moreover, when TSP is restricted to operate only on evacuation routes, travel time and delay time both decrease.

Benefits

This extended qualitative research in transit operations and catastrophic event management can provide various solutions and help decision makers and transit authorities. The simulation models were built using urban metropolitan areas, real-life conditions, and local agencies constraints. Therefore, these models provide an accurate representation of the current conditions and can be implemented by any local agency. Findings were concentrated on minimizing transit operation costs and travel time and improving safety, creating an overall improved emergency management plan.

Washington Metropolitan Area Transportation Authority (WMATA) was one of the local urban agencies used as a case study in the research. The research team has conducted various presentations and demonstrations to authorities at WMATA with positive feedback and plans for future implementation. In addition, the researchers are discussing the research work and findings with local authorities in Florida. This research, if/when approved by local transit agencies, can help the Federal Transit Administration (FTA) overall.

Project Information

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