"Motorcoach, Rural Roads, EMS, and Infrastructure Assessment Tool"
Project Overview

June 4th, 2013

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A crash of a motorcoach can result in mass casualties and require a particularly challenging and complex response from local emergency medical services (EMS). This response can place great strain on EMS assets and facilities, especially in rural areas. The National Transportation Safety Board (NTSB) recently issued a number of safety recommendations, one of which was to develop and implement criteria (based on traffic patterns, passenger volume, and bus types) that can be used to assess the risks of rural travel by large buses. Other NTSB recommendations were to evaluate the system of emergency care response to large scale transportation-related rural accidents and to develop plans to enhance wireless communication coverage.

This project develops an assessment tool *for states to use* to identify and evaluate the safety of rural routes that are utilized by motorcoaches. This work is being performed by the Center for Transportation Injury Research (CenTIR) at CUBRC with funding through a cooperative agreement with the Federal Highway Administration (FHWA). The project concept was developed by Mr. Keith Williams (FHWA), who is also providing technical oversight. This project is unique in that it seeks to generate an overall safety score for motorcoach routes based not only on the transportation infrastructure, but also on access to medical and trauma care. With inputs from both transportation professionals and EMS stakeholders, metrics are being developed to measure roadway infrastructure safety and traffic-related (crash) risks along a route, as well as robustness of communications, EMS response capabilities and proximity to hospitals and trauma centers.

A number of software packages related specifically to motorcoach operation, traffic safety analysis, and cross platform development were considered for integration and use on this project. Although none offered a ready-made solution, most were built upon (or already integrated with) a Geographic Information System (GIS). Given that the inputs to this assessment tool (locations of tourist attractions, motorcoach departure points, EMS bases, roadway characteristics, etc.) and the output of the assessment tool (safety scores along a route) are best presented in a geographic context, several GIS approaches were examined. Google Earth software was selected, largely because it is familiar to many analysts, permits the user to modify/expand the application, has basic viewers available (free) from Google and is already widely deployed in departments of transportation.

Access to emergency medical care is incorporated into this tool using the proof-of-concept design called the Model Inventory of Emergency Care Elements (MIECE), developed by the National Association of State EMS Officials (NASEMSO). The tool (as currently configured) provides the spatial analysis platform and initial data foundation for MIECE. However, work is still needed to acquire the detailed attribute data needed to fully populate the data layers and to develop the user interface to support planned MIECE queries (e.g., how many ambulances and emergency medical personnel are within 30, 60, or 90 minutes of roadway location X?).

Within the tool, point locations of key assets are mapped in separate data layers (e.g., cell tower layer, trauma center layer, etc). A grid (of one square mile resolution) is placed over each data layer and proximities to assets in each grid cell are calculated to create a raster or surface map of each data layer. These surface maps are then vertically combined and a total 'score' is computed for each grid cell. Roadway maps are then overlaid and the score for a given roadway segment is determined from the score in the grid cell that the road segment traverses. In this manner, 'grid' safety scores are converted to 'road segment' safety scores. The road segments can then be color-coded based on the safety score, after which the analyst can plot a specific motorcoach route and visually assess the safety of all parts of that route.

The tool currently exists as a prototype. Guidance is needed from knowledgeable stakeholders to assess the best way to weight and merge scores from different data layers. However, the tool will provide both automated and analyst-driven procedures to enable the analyst to view source data, selectively activate/deactivate resources, perform quantitative analyses and visualize response information under a variety of conditions. Examples of data layers incorporated (albeit with limited attribute data) in the GIS include:

- Detailed Roadway Characteristics
- Fatal and/or Injury Crashes
- 9-1-1 Centers (PSAPs)
- Cellular Towers
- Emergency Medical Transport Assets
    - Ground Ambulances
    - Air Medical Helicopters
- Medical Facilities
- Specialized Equipment Caches
- Attractions (likely motorcoach destinations)
- Motorcoach Companies Based / Operating in State
- Motorcoach Standard Routes, Frequency, & Transports (if known)

Each of these data layers will have a variety of attributes associated with each geographic location (e.g., ground ambulance data would include MIECE-recommended attributes such as depot location, number of vehicles, whether BLS or ALS, number of EMTs and paramedics, etc.) All suggestions and comments from users are welcome including specific attributes users would like to see incorporated in the design, even if data for these attributes are not yet available. Although this tool will focus initially on motorcoach route safety, it is expected to support analysis of a broad range of route safety and emergency response issues for the public at large.