

Motor Vehicle Fire Research Institute Awarded Contracts

Title: Accident Data Analysis and Investigation Tools

Contractor: The George Washington University

Duration: May 15, 2002 – November 15, 2003

Purpose:

The objective of this project is to develop enhanced methods and techniques for statistical analysis of accident data. These methods can help to streamline searches in various accident databases. They will allow functional and relational searching to quickly identify the injury patterns and dominant crash variables. Due to the complexity of the existing databases and numerous variables, this task is very difficult, complex and currently available with only basic and limited capability. Under this project we will develop methods and tools to simplify and automate many aspects of accident data analysis and apply them to selected problems for verification of software. Furthermore, these methods will be used to conduct various data analyses of fire safety related issues.

A series of databases compiled by the NHTSA, including the National Automotive Sampling System – Crashworthiness Data System (NASS/CDS), the General Estimates System (NASS/GES) and the Fatal Accident Reporting System (FARS) are sources of data that will be used in the analysis of detailed case studies. Statistical tools, including SAS and SUDAAN, will be used to query, condition, and evaluate crash attributes as they relate to occupant injury and survivability. These statistical tools will also be used to validate the automated query tool. Analytical techniques including frequency calculation of weighted crash counts, correlation analysis of crash conditions, and regression modeling to establish quantifiable relationships between crash conditions and crash outcomes will be applied to fire/fuel leakage associated variables.

The project has been divided into the following Tasks with associated Deliverables:

- **Task 1 – Develop NASS Analysis Tool for Fire and Fuel Leakage Cases**

A crash query and case summary reporting tool is currently under development to help researchers review historical crash cases collected through NASS/CDS. The web based query page will allow a user to select a specific subset of crashes from the database based on desired crash conditions. Further work is required to enhance the capabilities and usability of this tool as it pertains to fire/fuel leakage variables.

In general, a user will perform a query based on a series of limiting conditions. Based on this selection, two information types will be returned. First, data relating to the generated subset of crashes will be available for download to the user in tabular form. Since a large set of crash variables may be returned, a user will then be able to perform sorting and scanning on the data to look for trends and relationships between variables not evident during the initial query.

The second piece of information to be returned is a list of all cases that meet the query criteria. A user may then select a case for further investigation. Following case selection, an automated summary sheet(s) will be generated with significant crash variables presented along with applicable pictures and scene diagram.

An advance query option will be developed to allow users to select more specific crash descriptors, which will include all fire-related descriptors under this research project. Additionally, the returned information does not include all variables available from NASS/CDS. An interface will be developed to allow the web user to tailor the returned information to suit their application. A graphical representation of the damage and intrusion profiles based on CDC will be generated as well.

- **Task 2 - Data Analysis of Fire/Fuel Leakage Cases**

The aforementioned methodology/query tool, along with current best practice for conducting data searches and analysis will be used to investigate field data to determine the frequency of fuel leaks and fires by model year and by other crash attributes. To establish the seriousness or severity of this problem, injury and fatality frequencies during fire-involved crashes will be compiled. Overall HARM and associated casualty rates may then be established. Analysis will be performed to investigate the following:

- Investigate crash mode distribution in these cases (frontal, side, rear, rollover, etc.).
- Distinguish between single vehicle accidents and two car accidents, trying to determine whether the fire originated in the impacting or impacted vehicle, and whether the fire spread to the other vehicle. Investigate whether the injuries or deaths occurred in the impacting or impacted vehicle or both.
- Identify the ignition sources of the fires.
- Investigate accidents of similar severity and impact mode in which there was no fire. Compare and contrast events to identify causation of fire.
- Using supplemental information from CIREN cases and previous GM/DoT research, investigate and estimate times for fire onset, engulfment, response time, and rescue time. Attempt to provide information that may be relevant toward extending times for engulfment of occupant compartment.

- **Task 3 - Data Analysis Support to MVFRI Contractors**

Based on the resources and experience of the research staff at GWU, analysis and support will be provided to supplement other projects or additional needs of MVFRI. Examples of such tasks include the following:

- Provide vehicle counts and data for the calculation of exposure rates to support analysis of FARS and State data. Exposure rates are based on publicly available databases provided by NHTSA and FHWA.
- Support investigation of known fatality cases involving impact induced fires and comparison to cases present in FARS. Help to identify possible discrepancies in FARS and known cases, and support NHTSA to identify sources of discrepancies.