Motor Vehicle Fire Research Institute
Awarded Contracts

Title: Fuel System Technology Design Group Analysis

Contractor: Keith Friedman
Friedman Research Corporation

Start Date: February 15, 2004

Purpose:

Results from a previous analysis of State field data has indicated that fire rates for all vehicle classes has decreased over time. Additionally, the data suggested that light trucks, primarily pick-up trucks have experienced the greatest drop in fire rates. All vehicle types currently show similar fire rates. The purpose of this project is to conduct a follow-on study to attempt to identify what positive actions have taken place and/or what technologies have been introduced to help reduce the fire rates. This study will rely on data generated in the previous MVFRI funded studies by Friedman Research, Biokinetics, and The George Washington University. This will involve the analysis of fire related crash data by division of vehicles based on safety related technologies.

The overall project will focus on the "Causality of a Decrease in Fire Rates as Related to Fuel System Design Groups." This overall task will be divided into the following components:

- **Task A - Obtain and implement additional recent state data**

  Obtain an additional two states worth of data for use in the analysis. Adding an additional two states will expand the amount of accident data available for analysis. Minnesota and Washington would be the added states.

  In a subsequent activity additional states could be selected for single vehicle impact collision type evaluation, which are indicated as having the highest fire rates in any case. Comparison of these types will provide insight with regard to design approaches at higher crash severities.

  Implement the data files as needed and determine general fire rates for comparison with reference states already analyzed by vehicle type.

  Use the Polk VINA program to augment the vehicle information available in the available files including information regarding fuel and carburetor/fuel injection and other vehicle characteristics as available.

- **Task B - Coordinate the Identification of Design Groups with Biokinetics**

  We anticipate the following design groupings will be identifiable by Biokinetics for use in subsequent analyses.

  1. Fuel injection versus carburetion
  2. Plastic versus metal fuel tanks

3. Location of tanks (3 configurations, tank behind axle, tank in front and above axle, tank inside frame and forward of axle)
4. Fuel pump cutoff switch
5. Check valves and anti siphon valves.

For each grouping Biokinetics will identify the vehicles that have a design feature and the time of its introduction. The identification should include all sister vehicles or shared platform vehicles for which assessments of applicability have been made.

Biokinetics will provide the identification of the make/models/bodytypes/modelyear groupings that have the design features of interest. They will identify the appropriate make/model/bodytype/modelyear groupings for comparison to each for use in the various analyses (pre/post analyses, longitudinal studies, lateral studies, and matched pair type analyses). Identification of appropriate reference control groups will be identified by Biokinetics in the same way for use in analyses that have comparison groups that can be defined outside of the remaining fleet for that vehicle type. The model years considered should go back to the 1991 model year if possible.

- **Task C - Identify additional potential design groups**

  Identify potential design groups through the combination of the data from state, FARS, and NFIRS data for consideration by Biokinetics to identify whether engineering design approaches can be identified to explain high and low incidence of fires within groups. A longitudinal study of pick-up trucks will be performed first because of the highest drop in fire rates for that vehicle class. If insightful, passenger cars will follow.

- **Task D - Determine relative fire rates with state data by design groupings**

  Examples of analyses to be conducted are:

  1. Longitudinal comparisons of fire rates across model years for a particular design group variation (where one type of system was used and then replaced by another [either step function or phase in]), and
  2. Comparisons between the design group feature alternatives (e.g. carburetor v fuel injection, plastic v metal tanks, location alternatives) for the same accident years, and matched pair analyses (when feasible)

     The analysis will consider

     a) Effects of older vehicles (does the design approach help with the older vehicle population?)
     b) Effects for the 0-4 year old group and then the 5-10 year old group and 11+ year old vehicle groups as applicable.