Inter-Organization

Environmental Activities Staff
General Motors Corporation
General Motors Proving Ground
Milford, Michigan 48042

Date: September 7, 1978

Subject: Alternative Fuel Tank Locations in Light Trucks

To: W. Nantau

The purpose of this letter is to clarify and document a study which was done by Field Accident Research in response to a request from Design Staff. The request involved an assessment of the relative safety merits of two potential fuel tank locations which have been under consideration for 1981-1982 pickups. The two locations apparently are: (1) a side location either outboard or inboard of the frame (and inboard of the rocker panel), and (2) a rear location similar to certain current model light trucks.

The study used data comprising 1973-1976 current-model GM light trucks which were insured by MIC (Motors Insurance Corporation), a subsidiary of GM. Data on "current-model" light trucks are collected only during the actual model year. These accident cases routinely have been forwarded from MIC to SRDL, since 1968, for computer processing and study.

The methodology involved three steps:

(1) a gross overview of frequencies comparing "left side"* impacts, "right side" impacts, and rear impacts;
(2) a more detailed view which also looked at vehicle damage severity; and,
(3) a comprehensive case-by-case panel review.

Note that steps (1) and (2) only used computer searches, while step (3) involved a panel of engineers who were required to review, case-by-case, all available information (which included slides as well as several forms) on the cases of interest. The third step became necessary when we realized that the study required finer tuning than that afforded by routine computer search methods.

The actual results are as follows:

Step (1) resulted in the following table which shows the relative frequencies of pickups versus suburbans and blazers by type of impact:

	Pickups	Suburbans and Blazers
Right Impact	110	7
Left Impact	102	11
Rear Impact	28	-
	240	18

*where "left side" impacts, "right side" impacts and rear impacts have been defined so as to include only those types of impacts which might conceivably result in a fuel tank leak in the tank location under consideration (see appendix).

The above table shows that pickups represent, by far, the major portion of light trucks involved in these accidents.

Step (2), which used damage severity data in the form of "maximum inches of crush", led to Figure I, which is shown on the attached page. From Figure I two points are observed:

- While the figure shows there to be more higher severity impacts on the left side than on the right side (and vice-versa for lower severity impacts), these differences are not significant.
- Side impacts are more prevalent than rear impacts at each of the severity level groups;

At this point we should realize that the variable plotted in Figure I, "maximum inches of crush", while a fair measure of overall damage severity, is not a good measure of fuel tank leak/damage potential because it cannot focus well enough on the specific areas of damage in which we are interested. Step (3), then, attempted to estimate the fuel tank leak/damage potential for pickups by using a case-by-case analysis technique. This yielded the following results:

- The field representative sample of cases yielded 28 rear impacts and 212 side impacts;
- 4 of 28, or 14%, of the rear impacts were judged to have had high fuel tank leakage potential for rear located tanks;
- Approximately 40 of 212, or 19%, of the side impacts were judged to have had high fuel tank leakage potential for outboard side-located tanks. Moving these side tanks inboard might eliminate most of these potential leakers;
- Approximately 20 of 212 side impact cases were found with the filler neck cap missing at the time the insurance adjuster took photographs of the case vehicles.

In summary, Step (3) supports the observations made from Figure I.

In conclusion, while the data appear to favor a rear-located tank, it should be considered that a side-located tank, protected from the prop shaft, and positioned inboard of the frame, with more room for lateral motion [versus being caught, during a collision, between the frame and the striking object, as assumed in Step (3)] might become as effective as a rear-located tank.

George Garvil
Automotive Safety Engineering

attach.
copies: R. W. Bryant
R. Elwell
L. Faloon
D. Faust
D. McDonald
D. Pursel

014254

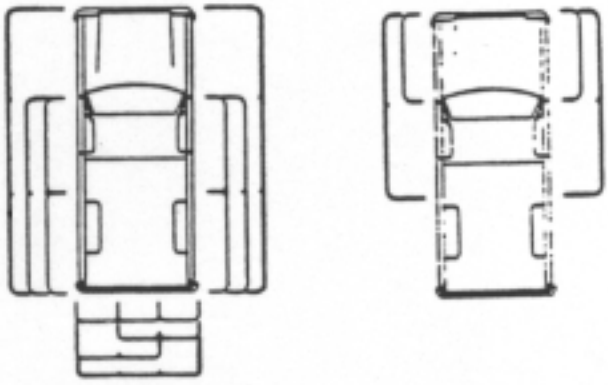
00008742

APPENDIX

Figure 2, below, illustrates the areas of damage included in the study. Notice that portions of the sides were selected to include only areas showing vulnerability to fuel tank damage.

Figure 2

Areas used in defining "left"; "right", and "rear" hits.



Areas Included

Areas not Included