

in this accident was the prolonged exposure of the disabled occupants of the automobile to high concentrations of the poison chemical mixture which escaped from shifted and damaged containers.

Contributing to the severity of the losses was the failure of the carrier to comply with the Motor Carrier Safety Regulations which call for the securing of cargo against load shift in the event of an accident; the pressurization of the cargo container, the still, hot, humid atmospheric conditions, the "fail-open" cylinder valve configuration, and delay in the removal of the disabled victims from the contaminated atmosphere.

## VI. RECOMMENDATIONS

The National Transportation Safety Board directed recommendations relating to this accident to the Secretary of Transportation on November 11, 1971, and April 27, 1972; copies are included as Appendix F.

The Safety Board further recommends that:

1. The Bureau of Motor Carrier Safety, Federal Highway Administration, develop and implement a program through which a statistical base can be accumulated for engineering design and crashworthiness criteria for container cargo securement,

cargo containment within the vehicle, and other hazard controls associated with vehicle acceleration and decelerations under accident conditions.

2. The Hazardous Materials Regulations Board (HMRB) of the Department of Transportation initiate rulemaking which would:

- (a) require manufacturers to submit to HMRB the hazard control measures utilized in the manufacture of hazardous materials.

- (b) compare the hazard control measures utilized in manufacture with those required for transportation of hazardous materials; and

- (c) take into consideration applicable hazard control measures resulting from these comparisons in the formulation of regulations for the transportation of hazardous materials.

The comparison should be placed in the public docket of rulemaking proceedings.

3. The Hazardous Materials Regulation Board of the Department of Transportation expeditiously act to bring about the development and implementation of "fail-closed" shut-off valves for containers used for transportation of liquefied hazardous materials under pressure to improve the crashworthiness of such containers in transportation accidents.