CONF-860604--2

IMPROVEMENTS IN RELEASE PROBABILITY BY USING AN OVERPACK*

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DE86 003077

For presentation and
publication in Summaries

IAEA International Symposium on
Packaging and Transportation of
Radioactive Materials
(PATRAM 86)

June 16-20, 1986

Davos, Switzerland

*Work sponsored by the U.S. Army Toxic and Hazardous Materials Agency in support of their Environmental Impact Statement for demilitarization of chemical warfare weapons.

**Operated by Martin Marietta Energy Systems, Inc., for the U.S. Department of Energy, under contract DE-AC05-840R21400.

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An analysis was performed to determine the probability of an unconfined release of hazardous material as a consequence of being involved in a severe transportation accident. Two packaging scenarios were considered: (a) material was palletized and placed in a standard aluminum sided trailer and (b) the same material was placed in an overpackage shown in Fig. 1. In addition to truck, both rail and air transport were also considered. Several release categories were defined ranging from minor to very large, and the effectiveness of the overpackage to reduce the probability of unconfined release was evaluated for each type of release category. The results are applicable to the transport of radioactive materials in similar overpackages.

The potential accident scenarios for a pallet of obsolete munitions were identified using a fault-free methodology. Standard data bases[1,2] were used to estimate the probability of an accident and the forces which resulted from the accident; however, some accident rate reduction was assumed to result from special administrative controls for truck convoys and munitions trains.

The failure thresholds for impact, puncture, crush, and thermal threats were determined analytically for both the palletized cargo and the cargo in an overpack.[3-6] These analytical results compared well with available test data and indicated that the use of the overpack virtually eliminated the crush threat.

For impact, a 40-ft free fall onto an unyielding surface was assumed as the failure threshold for both the unprotected cargo and the overpack. Actual test data demonstrate that the unprotected cargo would survive this drop. Although the analytical results indicated that the overpack would provide substantial cushioning, the calculations to precisely quantify the effect of the cushioning were not conducted. Moreover, the overpack itself has only been designed and tested for the standard NRC accident requirements (i.e., 30-ft drop). Hence, the study results were based on the conservative assumption that the overpack provides no risk reduction for impact-type failures.

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The greatest benefit derived from use of the overpack is its ability to reduce the heat input to the cargo in the event of an accident involving fire.

The study concludes that, although the capacity of a vehicle is reduced by the use of an overpack, it provides a quantified and substantial reduction of risk to its cargo when involved with the regulatory tests required by the NRC, for truck and rail transport. Improvements in the release probabilities from the use of an overpack are quantified in the full paper.

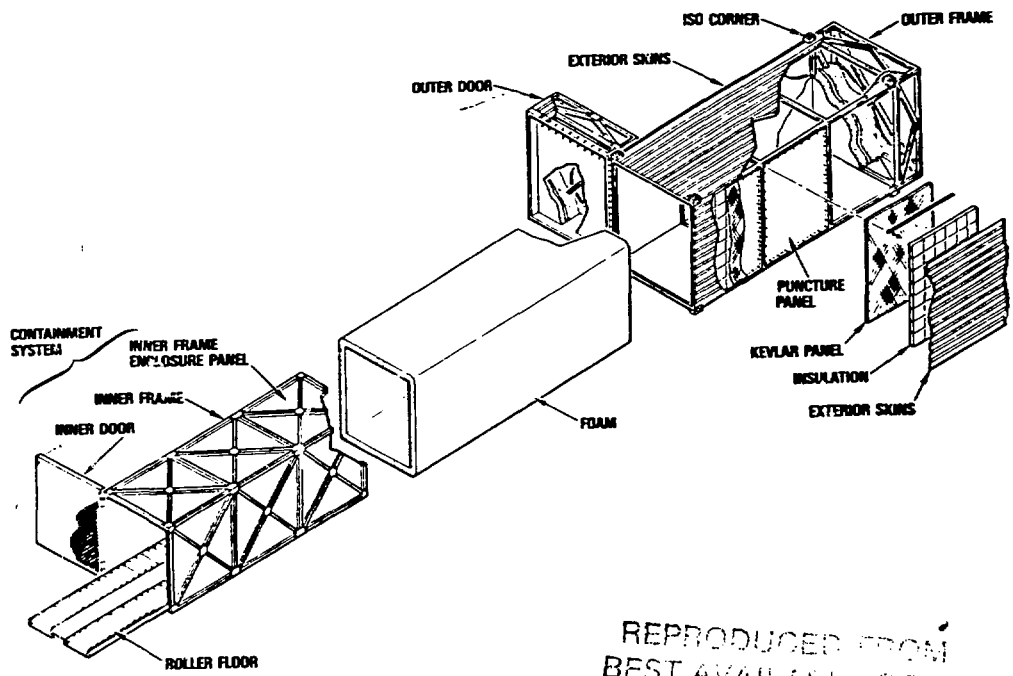

Fig. 1. Schematic of the assumed overpack.

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