# HISTORICAL VIEW AND EXPERIENCES WITH THE CRUSH TEST FOR LIGHT WEIGHT PACKAGES

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# Outline

**(1) Introduction**

**(2) Identifying a Lack of Safety**

- BAM Tests on Light Weight Packages

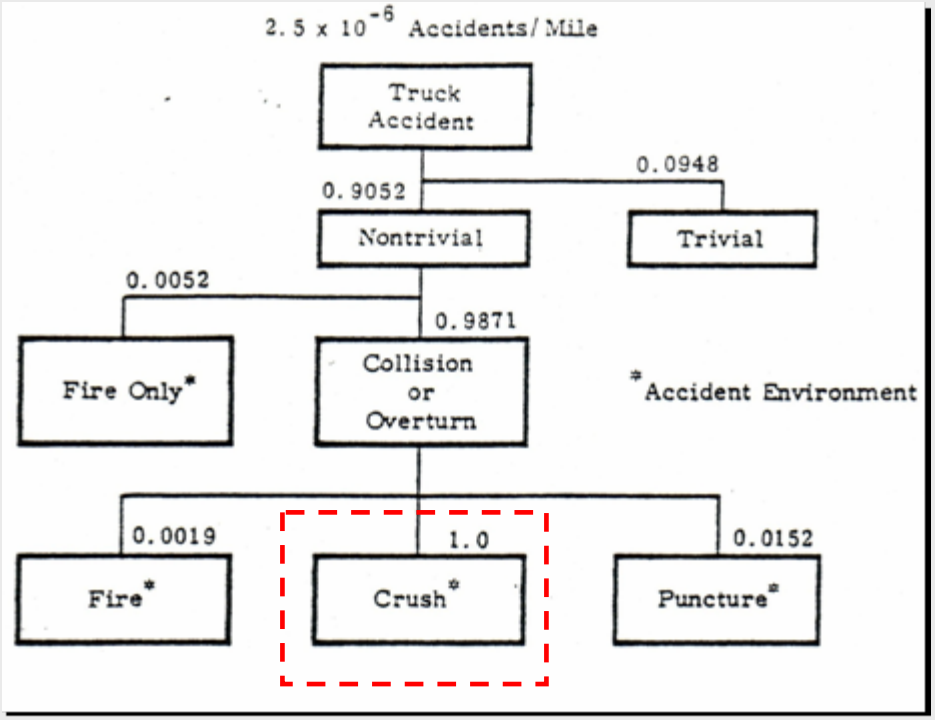
**(3) BAM Proposal for a Crush Test**

**(4) Today`s BAM Crush Test Performance**

# Introduction

- early IAEA regulations require no crush test for Type B Packages
- various authors and test facilities were able to prove that the level of safety provided by IAEA does not protect against dynamic crush forces

R.K. Clarke et al:
Severities of Transportation Accidents
Volume 1
SLA-74-0001
Sandia Laboratories
Albuquerque, NM, 1976



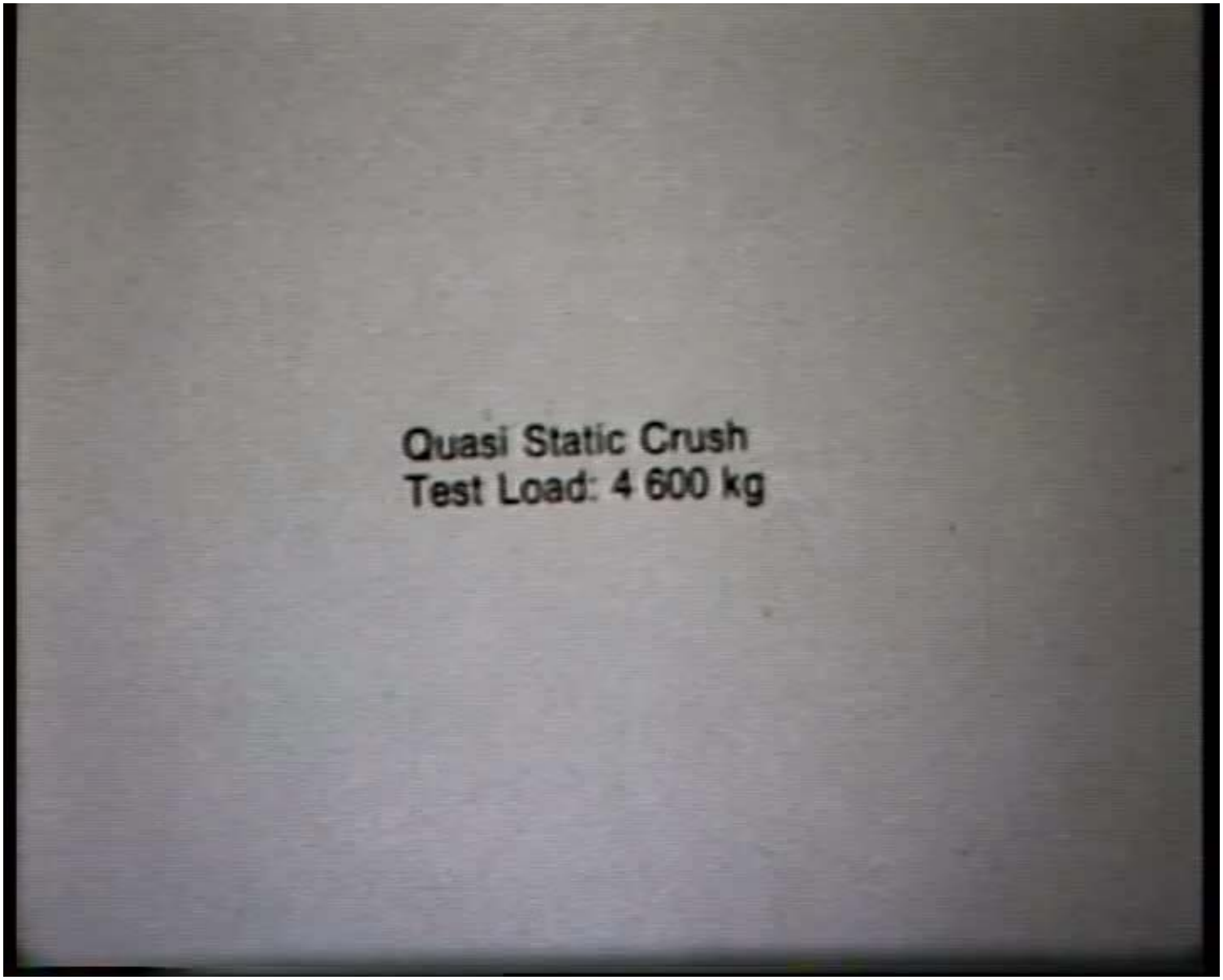

"*Every non-trivial accident causes crush forces to packages*"

# Identifying a Lack of Safety

- BAM designed a package which met all demands of the IAEA regulations

- tests where performed representing crush force inducing incidents
  - crush by the lowering of a truck load ramp
  - crush by running over with a truck
  - crush by a fork lift in operation
- the package failed in these incidents!

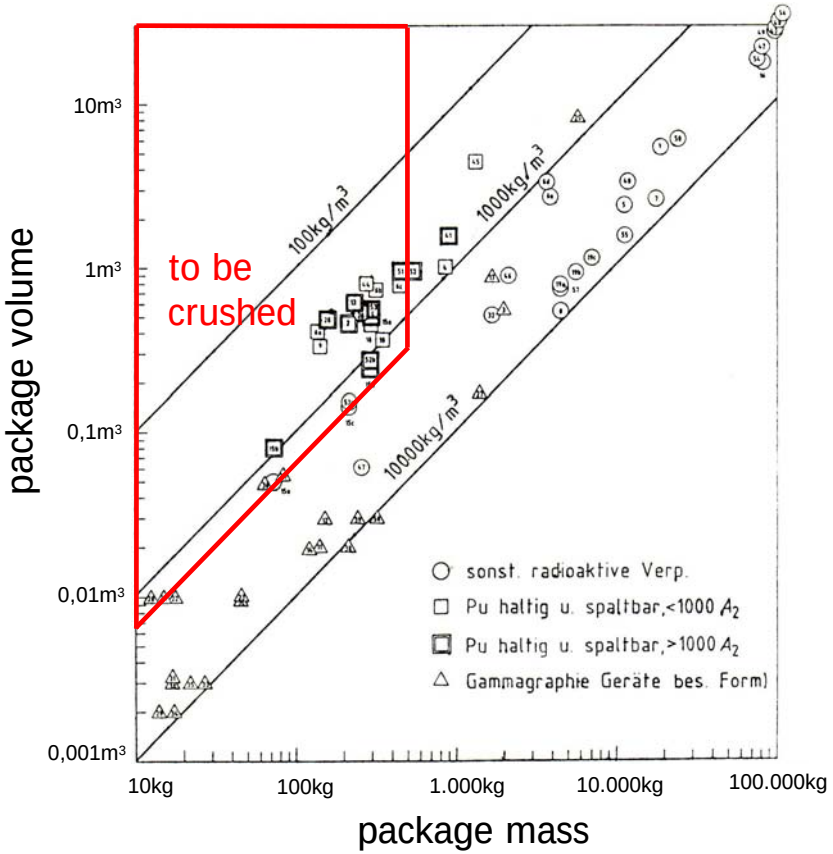
# Identifying a Lack of Safety



# BAM Proposal for a Crush Test

Which packages should be crushed?

BAM analysed all packages of approved transports from 1978 to 1981 concerning weight and volume



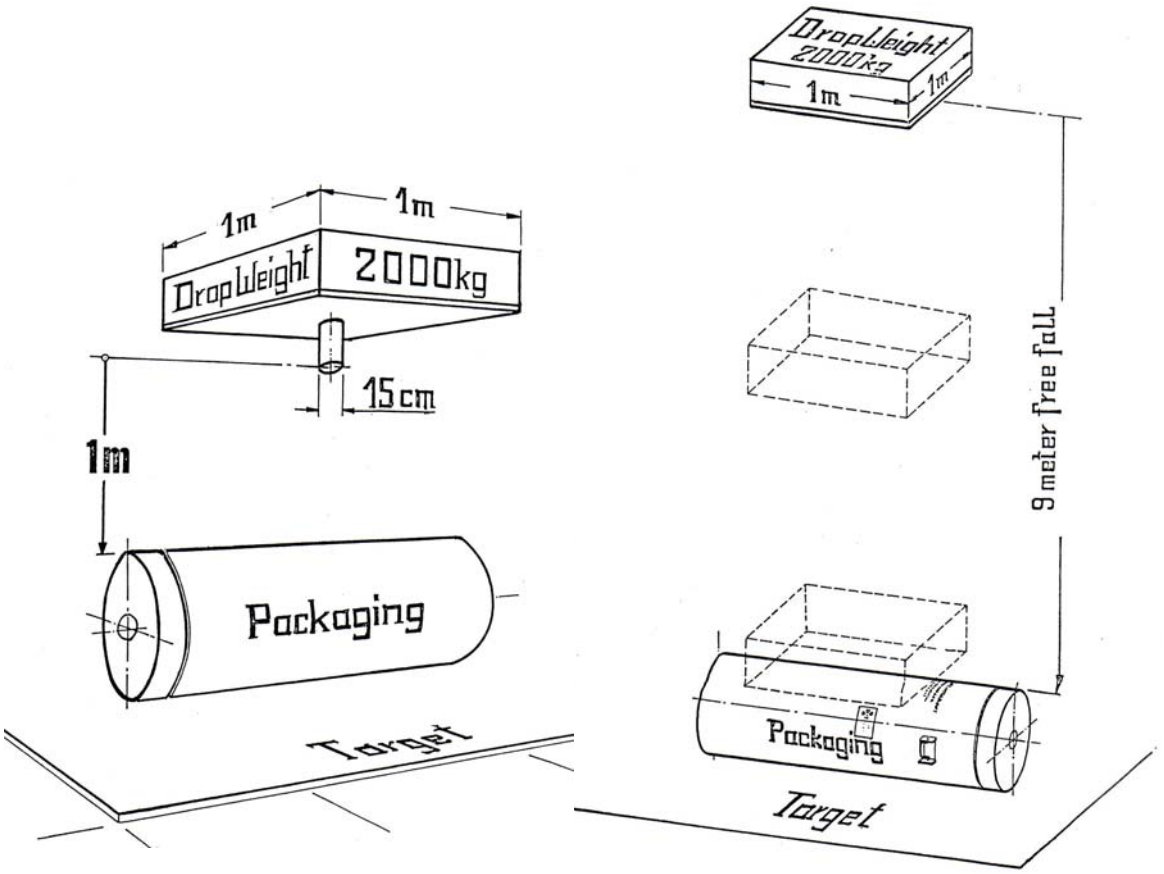

choosing a max. weight of 500 kg
and a density of 1500 kg/m³, nearly
all crucial packages could be tested with the crush-test

# BAM Proposal for a Crush Test

- BAM proposed a 9 m free drop weight of 2000 kg. The horizontal orientated mild steel plate should have an area of 1 m x 1 m.
- Additionally a crush using a 1 m free drop weight of 2000 kg with a 15 cm spike was planned.

The packages should:

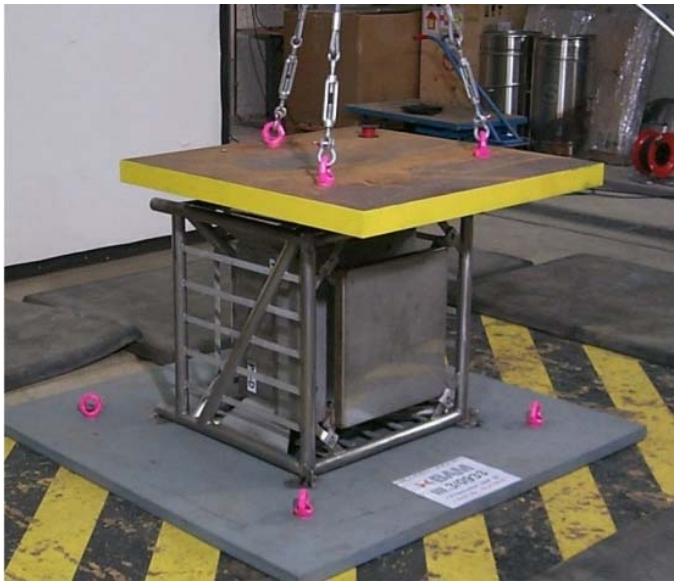
- contain no special form material
- have contents greater than 1000 $A_2$
- mass less then 500 kg
- density less then 1500 kg/m$^3$



# Today's BAM Crush Test Performance


Cask standing:

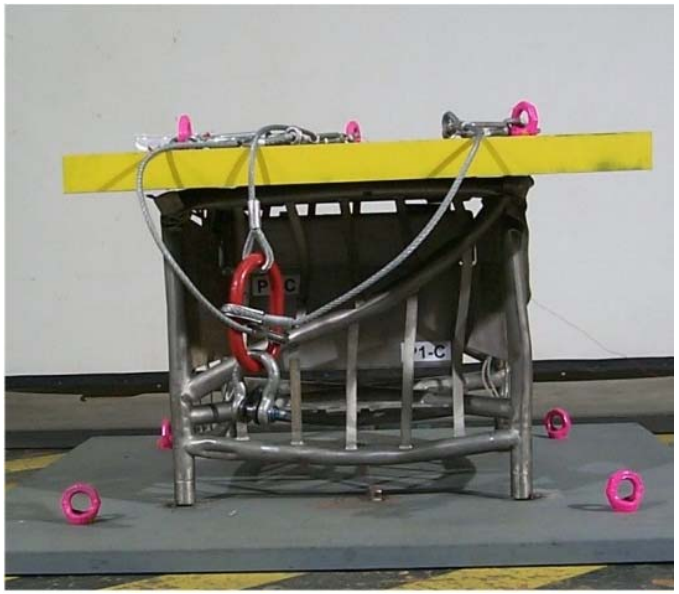

Horizontal corner edge position:



Lateral position:


Corner edge position:

# Today's BAM Crush Test Performance



Cask standing:

Horizontal corner edge position:

Lateral position:

Corner edge position:

# Thank you for your attention!