

8/29/02

1) What is the consequence of a large airplane being purposely flown into a dry storage cask?

Sandia National Laboratories is supporting the NRC in analyzing various sabotage scenarios, including large airplanes being purposely flown into a dry storage cask. Preliminary analysis shows no release of radioactive material under the scenarios investigated. The initial scenarios under investigation include a large airplane flying at a high speed horizontally into a storage cask, hard-points of the aircraft (such as the landing gear and engines) impacting the cask at various angles, and one scenario of a cask-on-cask impact have been examined. These analyses are currently being refined and documented.

2) What about the potential for fire resulting from the crash?

Previous aircraft crashes suggest that the likelihood of a long-term fire due to the fuel from an aircraft crash is small. Study of the WTC suggest that 1/3<sup>rd</sup> of the fuel from the aircraft were available for the fire and that this fuel was likely burned in less than 30 minutes. There was no long-term pool fire at the 911 crash in Pennsylvania or in the Pentagon crash. Preliminary analyses of the consequences of fires of less than an hour from these types of events have resulted in no release of RAM.

3) What about a small airplane filled with ( ) Ex2

Preliminary analyses suggest that the threat of a small plane filled with explosives is not a serious threat to these casks. The amount that can be carried, the likely stand-off distance and impact of the crash do not appear to be a serious threat. These aircraft are much smaller than those of the large aircraft examined at SNL, and therefore the consequences of the aircraft impacting the cask are considered small. The hard-points of the plane acting as a "flyer-plate" will not work effectively in this situation.

4) In general, how do these casks respond to ( ) events? Ex2

[Jack, we are getting a little more fidelity on this answer.]

5) Have you looked at transportation casks?

Preliminary analyses suggest that it will take a large amount of explosive to penetrate a transportation cask. As has been shown previously, HEDD devices can penetrate a cask wall.

6) What about other sorts of attacks?

There have been previous studies for ( ) There are currently analyses being conducted to investigate these types of loadings further. The NRC will conduct analysis on a wide variety of postulated attacks Ex2

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Portions Ex2

H/S

- 1) What is the consequence of a large airplane being purposely flown into a dry storage cask?

Sandia National Laboratories is supporting the NRC in the analysis of various sabotage scenarios, including large airplanes being purposely flown into a dry storage cask. The analyses performed to date suggest that release of radioactive material is unlikely for the scenarios investigated (a large jetliner diving or flying horizontally into the cask at high speed). Analyses examining the damage done to the cask by impact of the few large rigid components in a large aircraft (e.g., landing gear shafts, engine rotor shafts) also suggests that large airplane impacts into dry storage casks are not likely to lead to significant release of radioactive materials. These analyses are currently being refined and documented.

- 2) What about the potential for fire resulting from the crash?

Previous aircraft crashes suggest that most of the fuel on the plane is consumed in a short duration fireball and that the likelihood of a long-duration fire due to the burning of the fuel that escapes the fireball is small. Study of the jetliner crashes into the WTC buildings suggests that about 2/3<sup>rd</sup> of the fuel from the jetliners escaped combustion in the initial fireball. Approximately 1/3<sup>rd</sup> flowed down to other floors and it was estimated that the remaining fuel burned on the impact floors in less than 5 minutes. There was no long-term pool fire at the 911 crash in Pennsylvania. Preliminary modeling of the effects of one-hour fires on the dry storage cask predicts no release of RAM.

- 3) What about a small airplane filled with explosives?

Preliminary analyses suggest that a small plane filled with explosives is not a serious threat to dry storage or transportation casks. The amount of explosive that can be carried in a small plane and the likely stand-off distance of the ~~blast~~ from the cask upon detonation indicate that this scenario may not be of concern. In addition, because these aircraft are much smaller than the jetliner used in the sabotage jetliner crash scenarios, the consequences of the aircraft impacting the cask should be considered small. Ex2

However, an extensive survey of aircraft indicates that there are

- 4) In general, how do these casks respond to ~~events~~ events? Ex2

Portions Ex2