From: "Smith, Jeffrey" <jasmith@sandia.gov>
To: "'Mahendra Shah'" <MJS3@nrc.gov>, "Smith, Jeffrey" <jasmith@sandia.gov>
Date: 2/10/03 10:53AM
Subject: RE: Comments on Ken's e-mail (2-4-2003) and Jeff's Fax

Jeff's response

Mahendra:

Thanks for your comments. A few comments regarding your comments:

Regarding:

1) below:

The speeds shown in the table from the fax were taken directly from the data used to make the plots. So, the represent "exact" data off the plots. That is the reason there is the difference from what all of us had previously been referring to (and what some of the analyses were conducted at). I believe that the difference between [redacted] is beyond the resolution of our calculations. However, I agree that that issue will have to be addressed. The 16 ft vs. 15 ft spacing is a good point and will also have to be addressed. As you and I have discussed before, the SAR for the HI-Storm lists different minimum spacings. Also, how accurately are the casks placed on the pads? It is my intention to address the 4 ft and 5 ft spacing in the report.

Ex 2

We had no intentions of "re-running" [redacted]

Ex 2

2. below:

I am not completely convinced of the validity of adjusting the bolt strains to account for the increased momentum due to the remaining aircraft. However, I will think about that and try to address that issue. I would like to point out a few issues with this case; If you use the same approach as Doug Ammerman's hand calculation to determine the exit velocity of two casks to an impact of an aircraft the exit velocity of the two casks is higher than what I believe you are thinking (you can take Doug's e-mail on that and run through that calc very easily). I believe an important point that you are not accounting for is that at the 4 of 5 ft spacing the impact is not over, therefore the maximum velocity of one (or two casks) has not been reach yet. Addressing the whole event involves addressing what happens when the cask eventually stops. The possibility of a sudden stop is the greatest concern, and the one we are trying to address.

We have no calculations to [redacted] determine [redacted] We can make an assessment of what happens when the cask system is impacted by the aircraft and what happens to the [redacted]

Ex 2

As I stated above. I will try to address the issue of bolt strain in the case you mention.

In regard to "short-comings"

Portions Ex 2

E196

There are an infinite possible impacting directions on the pad and the casks. We have not addressed all of them. It is not possible with the time and resources we have to address all of them. Much less possible to determine what happens in a chaotic environment after the impact. Therefore, there are issues that we have not addressed and it is our intention to discuss those to some degree. "Short-comings" is not a term we plan to use and I don't believe is an accurate description of what we were referring to.

Second 2. below:

From the analyses we have conducted we can make some qualitative statements about what happens when a hard component impacts the cask. Including the lid area. However, you are right that not having those analyses run to completion is less than ideal. Once the nose landing gear hits there is a complete aircraft behind it to follow the impact of the landing gear. Our biggest defense in that area is that it appears that the landing gear strut would have to

Ex 2

3. below:

At this point our plan is to discuss all of our calculations at some point in the report. However, if that or any other analysis does not support the document in some way, we will not include it.

4. below:

We have radial velocities determined from CTH analyses conducted by Greg Bessette. If we are considering what happens to a full pad of casks, the cask cannot tip over without first impacting another cask. Therefore, we have to infer a radial velocity from our analyses of a single cask being impacted by the aircraft and not impacting another cask. It has been our opinion that the greatest threat to the cask integrity is

Ex 2

So, at this point our plan is to not do a "slap-down" type calculation. We believe we can explain that the

Also, we have MPC side and end impact calculations that can show the robustness of the MPC in a slapdown case.

I hope this response addresses some of your issues. I have tried to "reply to all." However, sometimes some of the NRC's recipients get bounced back to me. So you might verify that everyone at the NRC who should see this, get it.

Thanks,
Jeff

-----Original Message-----
From: Mahendra Shah [mailto:MJS3@nrc.gov]
Sent: Friday, February 07, 2003 12:09 PM
To: jasmith@sandia.gov
Cc: Bernard White; Daniel Huang; Earl Easton; Jack Guttmann; Robert Shewmaker; Ron Parkhill; jlsprun@sandia.gov; kbsoren@sandia.gov
Subject: Comments on Ken's e-mail (2-4-2003) and Jeff's Fax

Portions Ex 2

Jeff:

The approach outlined in Ken's e-mail and Jeff's fax is reasonable for completing the aircraft impact evaluation.

I have the following comments for your consideration.

1. The velocity in Table 1 is shown as for 1.2 m (4 feet) displacement, while the analyses in Table 2 are shown as for Based on the Figure 2, it appears that the velocity is more than Also, the 4 feet distance is based on the cask spacing of 15 feet. Please note that thecasks are spaced at 16 feet in the other direction for the PFS, and the clear distance would be close to 5 feet and not 4 feet. Ex 2

I would suggest that we should not run the csae again, but use the bolt strains for the and lineraly adjust for the increase in the impact velocity. Ex 2

2. In response to Ken's comment regarding considering the kintetic energy of the plane at the time the impacted cask impacts the adjacent cask, I would suggest the following, as discussed with you earlier.

Add the mass of the aircraft, which in the cask mass, and Once the first cask and the aircraft impact the second cask, the velocity of the total system would decrease significantly (to less than and the subsequent impacts on other casks should not be significant. Ex 2

In short, we should explain the whole phenomenon, and not state that we have short-comings in the analyses.

2. In the hard components analyses, please explain how you plan to address the cases 17 and 18 for the landing gear impacts, which were not completed (crashed).

3. Case 22 of the MPC in the C.G. over the corner orientation, impacting the rigid surface is unrealistic, as stated in the Table, and should not be discussed.

4. Case 24 for the MPC in horizontal orientation impacting the rigid surface identifies multiple velocities. Based the statements in the second pragraph in Item 1 of Ken's memo, I understand that the objective is to determine the capacity of the MPC, and then compare the estimated velocities to the capacity to demonstrate that the MPC would not breach. I understand that this case is related to the potential cask tip-over. Please discuss how we plan to determine the tip-over impact radial velocities.

Thanks.

Mahendra

Portions Ex 2