From: Staab, Christopher
Sent: Thursday, September 03, 2009 9:03 AM
To: NOSS Philip (AFS); TEMUS Charles (AFS)
Subject: Query: Teleconference to Discuss BRR structural questions

Chuck and Phil,

See below structural questions. Is there a good time today, tomorrow, or next week we could have a teleconference to discuss:

"The design basis deceleration of 120 g is conservative. There is reasonable assurance that the 120 g will bound all HAC free-drop loading conditions for the cask body and basket analysis. However, results of Test No. D2 **do not appear to be a valid choice** for the impact limiter performance evaluation for arriving at this value. The following should be considered in revising the application so that test results interpretation is properly aligned with determining the design basis deceleration of 120 g.

1. P 2.1-2. (1) In the 3rd bullet, remove impact limiter shells from the list of components governed by Subsection NF and (2) In Section 2.1.2..2, add specific language to identify also the foam strain limits as a design criterion for the impact limiters

2. P 2.7-1. The comparison made on referenced impact decelerations of calculated 72.2 g and measured full-scale 81.g is **misleading**. This is a major mischaracterization by stating, "[T]he half-scale test impacts were generally lower than predicted with one **exception** (emphasis added)**.**"

    - A number of misleading statements come from using results from Test D2, in lieu of Test D2R, as the basis for the Section 2.12.5, "Impact Limiter Performance Evaluation," including:
        i. Oversight on the validity of the test results
            - The test data may not be valid for benchmarking because compete failure of the impact limiter attachments
            - The measured primary impact levels are markedly higher than the secondary impact levels, by about 25%
    - The test data should further be low-pass filtered at about 400 hz to obtain peak rigid body motion. This will allow a proper interpretation of test results
    - Should provide appropriate rationale to use **Test D2R** for benchmarking by recognizing:
        i. The impact limiter attachment assemblage were less damaged or were not damaged with any significant structural consequence
        ii. The secondary impact is more severe than the primary impact as it should be.
    - The underscored typos should be corrected:

      "[t]he prediction was for an impact of 72.2 g, whereas the full-scale equivalent impact was 81.5 g."

      Table 2.12.5-24 lists the values of 71.0 g and 81.6 g, respectively.

3. P 2.12.3-3. Were the accelerometer calibration constants, such as those between 0.89 and 0.97 mV/g, a part of direct input to the "signal conditioning" before the test? When was the accelerometers calibrated, before or after the drop test? Was the calibration done with appropriate QA procedure?

4. P 2.12.3-5. The slapdown, D2, test may have to be considered invalid because of the markedly higher primary impact level of 140 g than the secondary impact of 107 g, which is complete opposed to the general observations and those would have predicted by the SLAPDOWN code.

    - Suggest use Test D2R for the evaluation. See also comments for Item 1 above.

5. P 2.12.3-6. Should the average secondary impact be 119 g instead?

    - (113+111+106+124)/4/cos(17^{o}) = 119 g
    - Note that the secondary impact of 119 g is greater than the primary impact of 115 g, as it should be.
    - Suggest consider the data low-pass filtered at 400 hz to obtain the rigid body deceleration for further data interpretation. See also comments for Item 1 above.
    - Suggest use Test D2R as the official crush results by revising the first sentence in the first paragraph of Page 2.12.3-7.

6. P 2.12.5-7. For the NCT free drop, the Section 2.12.5.2.2 statement, "[T]he maximum impact acceleration occurs in the 45^{o} slapdown orientation," is misleading. It should be revised to reconcile with the Section 2.12.5.2.1 statements, for the HAC free drop, "[T]he overall maximum impact acceleration occurs in the secondary impact, cold case, for a primary impact orientation of 15^{o}."

    - Both NCT and HAC free drop should result in the same conclusion that the15^{o} slapdown drop will produce the highest deceleration associated with the secondary impact.
    - The referenced Figure 2.12.5-16 prediction for the NCT 45^{o} slapdown drop appears to be a misuse of the Table 2.12.5-6 data for dynamic strength of the impact limiter at different drop angles.
    - The dynamic strength data are identically captured in Rev. 0 and Rev. 1 of the application. Therefore, identical results are expected from the SALPDOWN calculation to demonstrate that the 15^{o} slapdown drop governs.
    - Consistent with the discussion above, the deceleration vs. impact angle plot needs to be revised, as appropriate, to continue to show that the 15^{o} slapdown drop governs.

7. P 2.12.5-9. In the 4th paragraph, suggest revise to recognize the results associated with Test D2R, as appropriate.

    - See also comments for Item 1 above

8. P 2.12.5-10. Revise the text to recognize the maximum NCT impact associated with the 15^{o} slapdown drop.

    The 45^{o} slapdown drop appears to a mischaracterization of the test/predicted results.

9. Table 2.12.5-24. Revise the table by considering Test D2R, in lieu of D2, as the reference case for correlating the test results with the predicted by the SLAPDOWN modeling. The misleading information conveyed by the table includes the following:

    - Contrary to the calculated results, the tested secondary impact of 68.4 g is shown much less than the primary of 81.6 g. The calculated results are based on the theoretical formulation, which will predict a higher deceleration secondary impact than the primary impact
    - For the primary impact, the calculated crush distance of 10.6 inch is markedly larger than the tested at 7.8 inches. However, the corresponding calculated acceleration of 71.0 g is seen much smaller than the tested at 81.6 g, however."

Thanks,

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