Swanson, Greg

From: Finnegan, Charles
Sent: Tuesday, July 10, 2001 11:19 AM
To: Boyd, Max
Cc: Bell, James F; Swanson, Greg
Subject: RE: NDE After Proof Test

Max,

After reading Glenn Ecord's attachment, he makes the following points. First, "for safe life designs, a post proof inspection of welds is always necessary...to assure service life...". Second, if a pressurized compartment can be shown leak before burst, then post proof NDE may not be necessary. James reviewed the Alenia fracture control report this morning and the Node 2 primary structure is classified "safe life". There is no evidence of a leak before burst calculation or methodology employed for the pressure shell. Therefore, according to this logic, post proof NDE should be performed.

The safe life analyses of the Node 2 shell were performed with standard flaw sizes for the method of NDE used. Proof test cycles were included in the load spectrum. However, Glenn makes the point that "proof testing can open up or grow existing flaws, or in some cases, generate cracking." Flaws can also grow to unacceptable size during proof testing.

The JSC Safety Panel may buy off on no post proof test NDE if the Node 2 is shown to be leak before burst. This has not been done yet. A specific fracture mechanics calculation that shows that stability of a through flaw that is 10 times the wall thickness is required along with a safety assessment of the ramifications of an air leak through an orifice that size.

Post proof NDE or demonstration of leak before burst appear to be the two options right now. The best technical decision is to do the NDE. Note that the opinions expressed here are my own. Conclusions drawn from the Glenn Ecord discussion are my own interpretation.

Charlie

-----Original Message-----
From: Boyd, Max
Sent: Tuesday, July 10, 2001 8:16 AM
To: Swanson, Greg; Finnegan, Charles; Bell, James F; Kornel Nagy (E-mail)
Subject: FW: NDE After Proof Test

More info on Node 2 NDE. (See email at the bottom).

The Rev C to SSP 30558 is not posted on the PALS data base. I have talked to ISS/CM folks and they are trying to find a copy to post. During the meantime, here's the words from the CR (1265) that revised the document. In reading Glenn's "icon", I'm not clear on whether he is saying a post proof NDE is requiured for the Node 2 structure. Comments??

Max

SSP 30558 Revisions
1. Table 4.3.1.2-1 (11 places) From: "1" To: "t" Reason: Correction (Closes SIR Issue 2-062).
2. Add: "4.9 Fracture Control for Habitable Modules
For habitable modules, the pressure shell, which includes associated hatches, windows, and closeout or feedthrough panels, shall
comply with the design and structural verification requirements of SSP 30559. In addition, pressure shells shall be designed to
meet leak-before-burst (LBB) criteria. Pressure shells, or areas of pressure shells, that do not meet LBB criteria shall be verified as

safe-life using fracture mechanics methodology. All structural welds shall be inspected with suitable NDE to assure quality and
compliance with weld requirements. Welds in safe-life structure shall also be inspected for crack-like flaws after proof testing. The
results of the inspection after proof testing shall be used as the baseline for safe-life analysis."
APPENDIX B
Add: "HABITABLE MODULE
A pressurized, life-supporting enclosure or module that is normally intended to support life without the need for space-suits or
special breathing apparatus. The enclosure may be one that is continuously inhabited, or one that is used for crew transference, or
for crew accessible stowage so long as life support is a requirement for the design. Single mission or multi-mission module designs
are included."
Reason: Assures that habitable modules will not be forced to comply with much more stringent pressure vessel requirements.
(Boeing Prime Fracture Control Board agreement)
3. Para. 4.1 From: "an up-to-date list shall be maintained for fracture critical parts"
To: "an up-to-date list shall be maintained for
fracture critical and low risk fracture parts" Reason: NASA/JSC Fracture Control recommendation (correction).
4. Para. 4.2.1.3 Add: "Unacceptable released mass can also be assessed using the formula M=14/h, where M is the weight in
pounds and h is the travel distance in feet to the orbiter cargo bay aft bulkhead. M shall not exceed 2 pounds (908 gm)." Reason:
NASA/JSC Fracture Control recommendation (clarification).
5. Para. 4.2.2.3 From: "small shrouded or enclosed fans" To: "shrouded or enclosed fans less than 8 in. diameter and 8,000 rpm"
Reason: NASA/JSC Fracture Control recommendation (clarification).
6. Para. 4.2.3c From: "For multimission systems, it shall be verified before reflight that the structural redundancy of a fail-safe part
is still intact." To: "For multimission systems, it shall be verified by inspection to the extent practical before reflight that the
structural redundancy of a fail-safe part is still intact." Reason: NASA/JSC Fracture Control recommendation (clarification).
7. Para. 4.2.4.1
From: "shall not be a pressure vessel, pressurized component in a pressurized system..."
To: "shall not be a pressure vessel,
habitable module pressure boundary (shell), pressurized component in a pressurized system..." Reason: NASA/JSC Fracture
Control recommendation (clarification).
From: "Phase I Safety Review" To: "Phase II Safety Review" Reason: NASA/JSC Fracture Control recommendation (correction).
From: "compliance with these requirements shall be addressed in the Phase III Safety Review Package and the Fracture Control
Summary Report." To: "compliance with these requirements shall be addressed in the Fracture Control Summary Report." Reason:
NASA/JSC Fracture Control recommendation (correction).
8. Para. 4.2.4.2.1b From: "crack-like defects do not occur during machining of sheet, bar, and plate products..."
To: "crack-like defects do not occur during machining of sheet, bar, extruded and plate products..." Reason: NASA/JSC Fracture
Control recommendation (clarification).
SSP 30558 Revisions (cont'd)
9. Para. 4.2.3.2.2b1 From: "the maximum stress, Smax (includes Kt)," To: "the maximum stress, Smax ," Reason: NASA/JSC
Fracture Control recommendation (correction).
10. Para. 4.3.1.2.1 Add: "Flaws screened by proof test shall have aspect ratio a/c from 0.2 to 1.0." Reason: NASA/JSC Fracture
Control recommendation (clarification).
11. Figure 4.1-1 (6 places) From: "SUBJECT TO FRACTURE CRITICAL PART REQUIREMENTS" To: "SUBJECT TO
FRACTURE CONTROL REQUIREMENTS" Reason: NASA/JSC Fracture Control recommendation (clarification).
12. Appendix B, p. B-4 SINGLE POINT DIRECT CATASTROPHIC FAILURE From: "A direct catastrophic failure resulting

from fracture in a structural joint where the load is transmitted through a single fastener or pin."
To: "A direct catastrophic failure resulting from fracture in a structural part where the load is transmitted through a single fastener,
pin or other structural element." Reason: NASA/JSC Fracture Control recommendation (correction).

-----Original Message-----
From: Dean, Harry
Sent: Monday, July 09, 2001 9:20 AM
To: Boyd, Max
Subject: FW: NDE After Proof Test

Harry Dean
S&MA Lead
Node 2/Node 3

-----Original Message-----
From: BEREND, VINCENT L. (JSC-OE) (NASA)
[mailto:vincent.l.berend1@jsc.nasa.gov]
Sent: Monday, July 09, 2001 10:18 AM
To: 'Dean, Harry'; PIDO, KELLE I. (JSC-OE) (NASA)
Subject: FW: NDE After Proof Test

-----Original Message-----
From: ECORD, GLENN M. (JSC-EM) (NASA)
Sent: Monday, July 09, 2001 7:32 AM
To: ECORD, GLENN M. (JSC-EM) (NASA); LARSEN, AXEL M. (SKIP) (JSC-MA2) (NASA); WILLIAMS, JEFFREY G. (JSC-MA2) (NASA); O'BRIEN, DAVID E. (DAVE) (JSC-MA2) (NASA); BAUMER, GREGG J. (JSC-OE) (NASA)
Cc: BECKMAN, KEITH A. (JSC-EM) (NASA); MARTINEZ, ADRIEN (NICK) (JSC-EM) (LM); HORIUCHI, GAIL K. (JSC-EM) (NASA); BEREND, VINCENT L. (JSC-OE) (NASA)
Subject: RE: NDE After Proof Test

Here is a later and better (I think) version of the perspective for post-proof test inspection. Please disregard the original sent last week and use this one (for now) for future discussions if such is desired. Thanks.

Glenn

-----Original Message-----
From: ECORD, GLENN M. (JSC-EM) (NASA)
Sent: Thursday, July 05, 2001 7:29 AM
To: LARSEN, AXEL M. (SKIP) (JSC-MA2) (NASA); WILLIAMS, JEFFREY G. (JSC-MA2) (NASA); O'BRIEN, DAVID E. (DAVE) (JSC-MA2) (NASA); BAUMER, GREGG J. (JSC-OE) (NASA)
Cc: BECKMAN, KEITH A. (JSC-EM) (NASA); MARTINEZ, ADRIEN (NICK) (JSC-EM) (LM); HORIUCHI, GAIL K. (JSC-EM) (NASA); BEREND, VINCENT L. (JSC-OE) (NASA)
Subject: FW: NDE After Proof Test

Gentlemen,

Below is an example of questions that I am receiving from more and more persons including the fracture control board at MSFC. The issue has been prompted by a disagreement about post proof inspection on Node 2. Apparently the disagreement stems from a perceived precedent set by the Safety Panel for MPLM. I believe the issue exists because a clear understanding of requirements and purposes does not exist. The attached icon is an attempt to put things in perspective and presents the view that I have discussed with MSFC. I have not responded to individuals. I recommend clarification of the various aspects of the issue to the parties involved.

If anyone is in disagreement with what is presented in the icon please let me know immediately, because it reflects what I have told MSFC.

Thanks,

Glenn

-----Original Message-----
From: BEREND, VINCENT L. (JSC-OE) (NASA)
Sent: Tuesday, July 03, 2001 2:28 PM
To: ECORD, GLENN M. (JSC-EM) (NASA)
Cc: 'Dean, Harry'; PIDO, KELLE I. (JSC-OE) (NASA)
Subject: RE: NDE After Proof Test

Glenn, this is your area. Will you comment on how we treat "habitable vessel" differently from pressure vessels?

-----Original Message-----
From: Dean, Harry [mailto:Harry.Dean@msfc.nasa.gov]
Sent: Monday, July 02, 2001 5:05 PM
To: PIDO, KELLE I. (JSC-OE) (NASA); BEREND, VINCENT L. (JSC-OE) (NASA)
Subject: NDE After Proof Test

Has the SRP defined a category of "habitable vessel" (as opposed to pressure vessel) or some such thing so that there is not a requirement to NDE the welds after the proof test? Alenia seems to be under the assumption that the SRP set this precedent on MPLM and that Node 2 is not required (and they claim, not planning on) doing NDE after the proof test. Our hazard reports still indicate that it will be done. Can either one of you shed any light on this issue?

Harry Dean
S&MA Lead
Node 2/Node 3