X-Sender: cpapadim@pop200.gsfc.nasa.gov
X-Mailer: QUALCOMM Windows Eudora Version 5.0.2
Date: Wed, 05 Feb 2003 08:45:18 -0500
To: jmullin@mail.hq.nasa.gov, alee@mail.hq.nasa.gov, wfrazier@mail.hq.nasa.gov
From: Tsabikos Papadimitris <Tsabikos.A.Papadimitris@nasa.gov>
Subject: Fwd: Message from A.V. Diaz, Director

Jon, Art, Wayne:

You may already have heard but I wanted to pass the following e-mail to you. Judy Bruner is Goddard's single point of contact for safety and for all activities related to the Columbia tragedy. If I can help you in any way, please call me at 301 286-9361.

Charlie

X-Sender: gsfcpao@pop100.gsfc.nasa.gov (Unverified)
X-Mailer: QUALCOMM Windows Eudora Version 5.0.2
Date: Tue, 04 Feb 2003 12:05:48 -0500
To: gsfc_all@listserv.gsfc.nasa.gov
From: NASA/Goddard Space Flight Center <gsfcpao@pop100.gsfc.nasa.gov>
Subject: Message from A.V. Diaz, Director
Sender: owner-gsfc_all@listserv.gsfc.nasa.gov
Reply-To: NASA/Goddard Space Flight Center <gsfcpao@pop100.gsfc.nasa.gov>

Dear Colleagues:

Given the tragedy of the loss of the courageous crew of the STS 107, NASA immediately moved towards identifying an accident investigation board to give an independent review of the incident. Administrator O'Keefe made a commitment to the family members of the Columbia crew and to the public to determine the cause of the accident through intensive investigation and review.

To assist our participation in the investigations and reviews, I have asked Judy Bruner to serve as Goddard's single point of contact for all activities, from the impounding of data to coordinating support, both requested and volunteered. She will status our efforts, collect and consider your suggestions, and coordinate with NASA HQ. Judy serves as the Special Assistant to the Director and is prepared to assemble a coordinated communication with HQ, frequently and on demand. I encourage you to contact her at 301-286-7679 and at Judith.N.Bruner@nasa.gov.

Thank you for your continued cooperation and rapid response to our calls of support.

A.V. Diaz

****
Tsabikos A. Papadimitris, PE, CSP, MEM
"Mission Success Starts with Safety"
NASA/Goddard Space Flight Center

Safety & Environmental Branch
Safety Team Leader, Code 205.2
Phone: 301-286-9361 Fax: 301-286-1745
****

"USACE Acosta (E-mail)" <louis.a.acosta@HQ02.USACE.ARMY.MIL>,
"USACE Aguilera (E-mail)" <karen.durham-aguilera@usace.army.mil>,
"USACE Gilmore (E-mail)" <george.l.gilmore@usace.army.mil>,
"USACE Hecker (E-mail)" <edward.j.hecker@usace.army.mil>,
"USACE Irwin (E-mail)" <william.e.irwin@usace.army.mil>,
"USACE Miller (E-mail)" <lizbeth.h.miller@usace.army.mil>,
USACE OPS
<ce-uoc@usace.army.mil>
Subject: FW: RIV, Possible Shuttle Debris Discovery
Date: Thu, 6 Feb 2003 13:58:54 -0500
X-Mailer: Internet Mail Service (5.5.2656.59)

> -----Original Message-----
> From: Dupree, Annette
> Sent: Thursday, February 06, 2003 12:11 PM
> To: R4-INCIDENT-LIST; Evans, Charleen W; R06-ROC-ESF5; EST-ESF05PLNC
> Subject: RIV, Possible Shuttle Debris Discovery
>
> The following entry has been posted in the NEMIS journal, Incident
> Activity Manager under the Shuttle Mishap:
>
> A citizen in Wilson County reported the discovery of several pieces of
> what looked like metal corrugated (cardboard) type of material. The
> Sheriff's Department (HazMat Team) has the items secured and are holding
> for investigation. The items were found last night 02/05/03.
>
> Another local in Murfreesboro, Rutherford County, found some small green
> tinted "rocksalt" type material. These were found Tuesday, about 7:30 PM,
> but had been thrown in the trash. When they heard the news they removed
> them and called and reported the findings to the Rutherford County EMA.
> The local Sheriff's Department has the item.
>
> Both discoveries were reported to NASA.
>
>
>
> Annette Dupree
> Emergency Management Program Specialist
> R4, Response and Recovery Division
> Response Operations Branch
> 402 S. Pinetree Blvd.
> Thomasville, GA 31792
> v: 229/225-4579
> f: 229/225-4687
>
>

Jonathan B. Mullin
Manager Operational Safety
Emergency Preparedness Coordinator
Headquarters National Aeronautics and Space Administration
Phone (202) 358-0589
FAX (202) 358-3104
"Mission Success Starts with Safety"

To: Richardson_Pamela
From: "Jonathan B. Mullin" <jmullin@hq.nasa.gov>
Subject: Fwd: FW: RIV, Possible Shuttle Debris Discovery
Cc:
Bcc:
Attached:

More history for logging. Jon
From: FEMA OPERATIONS CENTER <FEMA.OPERATIONS.CENTER@fema.gov>
To: Action Officer <ActionOfficer@fema.gov>,
"AOC (E-mail)"
<agstenos@hqda-aoc.army.pentagon.mil>,
ARNGOPS <ARNGOPS@ngb.army.mil>,
"BBS Submissions (E-mail) (E-mail)" <BBSSubmissions@fema.gov>,
"Bothell MOC (E-mail) (E-mail)" <Bothell.MOC@fema.gov>,
"Brian Montgomery (E-mail)" <brian.montgomery@fema.gov>,
"Cameron, Bruce"
<Bruce.Cameron@fema.gov>,
Charles Stewart <Charles.Stewart@navy.mil>,
"D'Araujo, Jack" <Jack.D'Araujo@fema.gov>,
David Fleischman
<David_Fleischman@hud.gov>,
")"
"Denton MOC (E-mail)"
<Denton.MOC@fema.gov>,
"Denver MOC (E-mail)" <Denver.MOC@fema.gov>,
DOE
<rsp.div@hq.doe.gov>, "DOEHQEOC (E-mail)" <DOEHQEOC@OEM.DOE.GOV>,
"DOI OPS CENTER (E-mail)" <doi_watch_center@ios.doi.gov>,
"Earman, Margie" <Margie.Earman@fema.gov>,
"Edward Massimo (E-mail 2)"
<Edward.C.Massimo@HQ02.USACE.ARMY.MIL>,
EMAC <emac@adem.state.ar.us>,
"EPA-EOC HQ (E-mail)" <EOC.EPAHQ@epa.gov>, EST-DIR <EST-DIR@fema.gov>,
"FCC Bonnie Gay (E-mail)" <bgay@fcc.gov>,
FEMADESKREPS
<FEMADESKREPS@fema.gov>,
"GRACE. SHEFFEY (E-mail)"
<GRACE.SHEFFEY@FNS.USDA.GOV>,
"GSA Montgomery (E-mail)"
<kathy.montgomery@gsa.gov>,
"gsa. nsep@gsa. gov (E-mail)"
<gsa.nsep@gsa.gov>,
"Hess, Charles" <Charles.Hess@fema.gov>,
"Homeland Security (E-mail)" <ohscc@who.eop.gov>,
"HUD McCarthy (E-mail)"

<bruce_e._mccarthy@hud.gov>,
"HUD Opper (E-mail)" <jan_c._opper@hud.gov>,
"James Lloyd (E-mail)" <JLloyd@hq.nasa.gov>,
"Jerry Ostendorf (E-mail)"
<jerry.ostendorf@emd.state.ia.us>,
"Jonathan Mullin (E-mail)"
<JMullin@hq.nasa.gov>,
"Karen Maguire (E-mail)" <karen.maguire@usda.gov>,
"Lowder, Michael" <Michael.Lowder@fema.gov>,
"Maynard MOC (E-mail)"
<Maynard.MOC@fema.gov>,
"Naval District, Washington - Security and LE Dir."
<Stewart.Charles@ndw.navy.mil>,
"NCS (E-mail)" <NCS@NCS.GOV>,
"NIGHT1 (E-mail)" <NIGHT1@USA.REDCROSS.ORG>,
"Nmci (E-mail)"
<NMCICommandCenter@eds.com>,
"Nora Lewis (E-mail)" <nlewis@USAID.GOV>,
"NORTHCOM LNO Todd Chamberlain (E-mail)"
<todd.chamberlain@js.pentagon.mil>,
"NORTHCOM Robert Price (E-mail)"
<robert.price@NORTHCOM.mil>,
"Paolin Hatch (E-mail)"
<paolin.hatch@gsa.gov>,
"ROSTOSKYC (E-mail)"
<ROSTOSKYC@USA.REDCROSS.ORG>,
"Russell, Barbara"
<Barbara.Russell@fema.gov>,
"Thomasville MOC (E-mail)"
<Thomasville.MOC@fema.gov>,
"Zensinger, Larry"
<Larry.Zensinger@fema.gov>;
"DOD/DOMS Lacrosse (E-mail)"
<thomas.lacrosse@doms.army.mil>,
"DOMS (E-mail)" <foxhole@doms.army.mil>,
DOMS Sullivan <ricki.sullivan@doms.army.mil>,
"Porter, Larry"
<Larry.Porter@fema.gov>,
"Riddle, Margaret" <Margaret.Riddle@fema.gov>,
"DOT Benini (E-mail)" <janet.benini@rspa.dot.gov>,
"DOT Carney (E-mail)"
<brian.carney@rspa.dot.gov>,
"DOT Medigovich (E-mail)"
<bill.medigovich@rspa.dot.gov>,
"DOT OPS - 1 (E-mail)"
<tioc-01@rspa.dot.gov>,
"DOT OPS 2 (E-mail)" <tioc-02@rspa.dot.gov>,
"HOWARD. EDWARDS (E-mail)" <HOWARD.EDWARDS@rspa.dot.gov>,

To: "Camomilli-1, Guy" <Guy.S.Camomilli@nasa.gov>
From: "Jonathan B. Mullin" <jmullin@hq.nasa.gov>
Subject: Re: Approved One-Page Shuttle Debris Fact Sheet
Cc: Lloyd_James,lemke-john
Bcc:
Attached:

Guy has this gone to all of the response locations? Jon
At 01:32 PM 2/6/2003 -0500, you wrote:
ATTENTION DEBRA ADDE:

The attached guidelines have been approved by the Chief Health and Medical Officer (Dr. R. Williams) for general dissemination to public service personnel.

Please give it a broad distribution from your command post. If you have any questions, please don't hesitate to call.

Thank you.

Guy Camomilli, MPH, CSP
Senior Environmental Health Officer,
OCHMO Tenant Office
guy.camomilli-1@ksc.nasa.gov
Voice (321) 867-1417
Fax (321) 867-8870

Jonathan B. Mullin
Manager Operational Safety
Emergency Preparedness Coordinator
Headquarters National Aeronautics and Space Administration
Phone (202) 358-0589
FAX (202) 358-3104
"Mission Success Starts with Safety"

chuck-mertz, 11:12 AM 2/10/2003 -0500, Potential Briefing of Mishap Board

To: chuck-mertz
From: "Jonathan B. Mullin" <jmullin@hq.nasa.gov>
Subject: Potential Briefing of Mishap Board
Cc: Lloyd_James
Bcc: cpaecco@sbcglobal.net,Mullin_Jonathan
Attached:

Chuck, at 1100 hours EST, February 10, 2003, I followed up with Mr. Jim Lloyd concerning the potential briefing of the Mishap Board.

Jim indicated that he has not finalized any details with Bryan O'Connor concerning this matter.

Could you give Mr. Lloyd a call at 202-358-0557?

Regards, Jon
Jonathan B. Mullin
Manager Operational Safety
Emergency Preparedness Coordinator
Headquarters National Aeronautics and Space Administration
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FAX (202) 358-3104
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To: lemke-john
From: "Jonathan B. Mullin" <jmullin@hq.nasa.gov>
Subject: 107 Board Questions
Cc: tom-whitmeyer, Rutledge_Peter, Richardson_Pamela
Bcc: Mullin_Jonathan
Attached:

Consider the following for SMART Investigation Questions:

Palmdale:

1. Call former SMA from Palmdale Space Shuttle who can comment on workmanship, MRB activities, open paper, successes, schedules,etc. during Orbiter upgrades and maintenance.
2. Consider requesting lists of Federal and Contractors who have worked on NASA Resources.
3 Provide all DRLs, contracts, and formal reviews.
4. Records of NASA Headquarters (Code Q) oversight of this location.

Regards, Jon

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Emergency Preparedness Coordinator
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To: Pete Rutledge <prutledg@hq.nasa.gov>
From: "Jonathan B. Mullin" <jmullin@hq.nasa.gov>
Subject: Fwd: Foam problem
Cc:
Bcc:
Attached:

Here is an idea. Jon
From: "Cardinale-1, Michael" <Michael.A.Cardinale@nasa.gov>
To: "Frazier, Wayne" <wfrazier@mail.hq.nasa.gov>,
"Mullin, Jonathan" <jmullin@mail.hq.nasa.gov>
Subject: Foam problem
Date: Tue, 4 Feb 2003 10:23:59 -0500
X-Mailer: Internet Mail Service (5.5.2653.19)

I'm sure the idea has already come up, but has anyone considered using some type of 'hair net' to wrap the ET and suppress delaminating foam?

Mike

Jonathan B. Mullin
Manager Operational Safety
Emergency Preparedness Coordinator
Headquarters National Aeronautics and Space Administration
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Cardinale-1, Michael, 12:20 PM 2/4/2003 -0500, Re: Foam problem

To: "Cardinale-1, Michael" <Michael.A.Cardinale@nasa.gov>
From: "Jonathan B. Mullin" <jmullin@hq.nasa.gov>
Subject: Re: Foam problem
Cc:
Bcc:
Attached:

Yes, a good idea, I forwarded to Code QE. Regards, Jon
At 10:23 AM 2/4/2003 -0500, you wrote:
I'm sure the idea has already come up, but has anyone considered using some type of 'hair net' to wrap the ET and suppress delaminating foam?

Mike

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To: Dan-Thomas
From: "Jonathan B. Mullin" <jmullin@hq.nasa.gov>
Subject: Legal Claims
Cc: Art Lee,Lyver_John,Lloyd_James,lemke-john
Bcc: Mullin_Jonathan
Attached:

Dan we spoke briefly concerning the Claims Against NASA yesterday and that Sara Najjar-Wilson was working with an Agency Group. Do you have any policy or process that was cleared by the HCAT which can be sent to the field?
In order to keep the process effective, I would think that the Code G channels are most efficient. Historically, I would suspect the hardest part of the claim process would be assuring that the claims were "real." I understand that information is forthcoming in the near future.
Regards, Jon

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Emergency Preparedness Coordinator
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To: wayne kee
From: "Jonathan B. Mullin" <jmullin@hq.nasa.gov>
Subject: Fwd: FW: DOT Requirements
Cc: jim-cheek,Bob Gaffney,Angotti-Cathy
Bcc: Richardson_Pamela,Mullin_Jonathan,guy-camomilli
Attached:

Please, Assure that our field persons have this guidance in the Command Centers. Regards, Jon

From: "Camomilli-1, Guy" <Guy.S.Camomilli@nasa.gov>
To: "Keprta, Sean" <sean.r.keprta1@jsc.nasa.gov>,
"Angotti, Cathy" <cangotti@hq.nasa.gov>,
"Mullin, Jonathan" <jmullin@mail.hq.nasa.gov>,
"Barry-1, William" <William.S.Barry@nasa.gov>,
"Gettleman-1, Alan" <Alan.G.Gettleman@nasa.gov>
Cc: "Roberts-1, Donald" <Donald.Roberts-1@ksc.nasa.gov>
Subject: FW: DOT Requirements
Date: Tue, 18 Feb 2003 10:13:57 -0500
Importance: high
X-Mailer: Internet Mail Service (5.5.2656.59)

FYI

I asked Don Roberts to coordinate directly with Don Paniale on these requirements directly. Here's the information.

Guy Camomilli, MPH, CSP
Senior Environmental Health Officer,
OCHMO Tenant Office
guy.camomilli-1@ksc.nasa.gov
Voice (321) 867-1417
Fax (321) 867-8870

-----Original Message-----
From: Roberts-1, Donald
Sent: Monday, February 17, 2003 3:19 PM
To: Camomilli-1, Guy; Paniale, Donald A
Cc: Cardinale-1, Michael; Creech-1, Joanne; Ouellette-2, Robert (SGS)
Subject: DOT Requirements

Guy/Don

Based on our conversations concerning the suspected infectious substances at Barksdale AFB and using a conservative approach on the hazard classification of the material, I have outlined the general DOT requirements for transportion by public highway below.

1. The material is classified as a DOT hazardous material, hazard class 6, division 6.2 infectious substance
2. Shipping papers must include

* The DOT shipping description "Infectious substances, affecting humans (in the parentheses you must identify the name(s) of the infectious substance(s). If there are more than (1) you must list at least (2)), 6.2, UN2814" (29 CFR 172.101, 172.202)

* Total quantity of hazardous material including unit of measure (49 CFR 172.202)

* Signed shippers certification that states that the material is offered for transportation in accorance with the regulations. The regulations require a specific certification that is generally pre-printed on documents used for shipping hazardous materials. (49 CFR 172.204)

* Emergency response telephone number. The number must be monitored at all times the material in transport and must be manned by a person knowledgeable of the hazardous material being shipped (49 CFR 172.604)

* Emergency response information. The easiest way to comply with this requirement is to reference the guide number in the "Emergency Response Guidebook" and ensure that the driver carries the guidebook with the shipment or a copy of the specific guide is attached to the paperwork. The guide number is "158" for the haz material ID# UN2814. If you feel that additional emergency response information is needed include this in addition to the above information. (49 CFR 172.602)

3. Packaging must be comprised of a watertight primary receptacle (glass metal or plastic with a positive means of ensuring a leakproof seal such as heal seals or adhesive tape on screw caps.), a watertight secondary package, and an outer package that is capable of passing the tests specified in 49 CFR 173.609. I have never checked with container suppliers to see if they carry drums or boxes that meet this criteria but I am sure that they do.

4. An itemized list of the contents of the package must be enclosed between the secondary packaging and the outer packaging. (49 CFR 173.196)

5. Each outer packaging must be marked with the "Infectious Substance" label. (40 CFR 173.432)

6. Driver must have the appropriate hazardous materials training (49 CFR 172.700)

7. There is no DOT requirement for placarding the vehicle.

I'm sorry if this seems confusing but there are special requirements for infectious substances as well as the general requirements. I tried to provide only the information pertinent to your situation as I understand it. Please let me know if I can provide any additional support.

Don Roberts, CHMM
Lead Engineer, Evaluation and Planning
SGS Waste Management
Phone: (321) 867-8642
Fax: (321) 867-9390

Jonathan B. Mullin
Manager Operational Safety
Emergency Preparedness Coordinator
Headquarters National Aeronautics and Space Administration
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"Mission Success Starts with Safety"

gloria-joyner, 11:04 AM 2/11/2003 -0500, Columbia Updates

To: gloria-joyner
From: "Jonathan B. Mullin" <jmullin@hq.nasa.gov>
Subject: Columbia Updates
Cc: Hill_William
Bcc: Lloyd_James,Art Lee,lemke-john,Mullin_Jonathan,Richardson_Pamela
Attached:

Gloria, just a note to follow up on a call I placed to the EST this morning. I spoke with the EST indicating that NASA had not received any situation updates from the field since yesterday at 1229 hours.
Apparently reports were sent but we did not receive them. Is there a problem I need to address?
Regards, Jon

Jonathan B. Mullin
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Emergency Preparedness Coordinator
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Joyner, Gloria, 11:29 AM 2/11/2003 -0500, RE: Columbia Updates

To: "Joyner, Gloria" <Gloria.Joyner@fema.gov>
From: "Jonathan B. Mullin" <jmullin@hq.nasa.gov>
Subject: RE: Columbia Updates
Cc:
Bcc: lemke-john,Lloyd_James,Hill_William
Attached:

Thanks, I have not seen them on the screen as of this time. Again, thank for your help. Regards, Jon
At 11:27 AM 2/11/2003 -0500, you wrote:
Jon:

I understand an update was sent. Please let me know if you ned anything else from FEMA.

Gloria

-----Original Message-----
From: Jonathan B. Mullin [mailto:jmullin@hq.nasa.gov]
Sent: Tuesday, February 11, 2003 11:04 AM
To: Gloria.Joyner@fema.gov
Cc: whill@hq.nasa.gov
Subject: Columbia Updates

Gloria, just a note to follow up on a call I placed to the EST this morning. I spoke with the EST indicating that NASA had not received any situation updates from the field since yesterday at 1229 hours. Apparently reports were sent but we did not receive them. Is there a problem I need to address?
Regards, Jon

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To: Richardson_Pamela
From: "Jonathan B. Mullin" <jmullin@hq.nasa.gov>
Subject: Fwd: RE: Columbia Updates
Cc:
Bcc:
Attached:

Date: Tue, 11 Feb 2003 11:29:33 -0500
To: "Joyner, Gloria" <Gloria.Joyner@fema.gov>
From: "Jonathan B. Mullin" <jmullin@hq.nasa.gov>
Subject: RE: Columbia Updates
Bcc: lemke-john,Lloyd_James,Hill_William

Thanks, I have not seen them on the screen as of this time. Again, thank for your help.
Regards, Jon
At 11:27 AM 2/11/2003 -0500, you wrote:
Jon:

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Gloria

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From: Jonathan B. Mullin [mailto:jmullin@hq.nasa.gov]
Sent: Tuesday, February 11, 2003 11:04 AM
To: Gloria.Joyner@fema.gov
Cc: whill@hq.nasa.gov
Subject: Columbia Updates

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Regards, Jon

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James Lloyd, 10:00 AM 2/4/2003 -0500, Email with JSC (Operational note)

X-Authentication-Warning: spinoza.public.hq.nasa.gov: majordom set sender to owner-code-q using -f
X-Sender: jlloyd@mail.hq.nasa.gov
X-Mailer: QUALCOMM Windows Eudora Version 4.3.2
Date: Tue, 04 Feb 2003 10:00:47 -0500
To: code-q@lists.hq.nasa.gov, smadir@hq.nasa.gov
From: James Lloyd <jlloyd@hq.nasa.gov>
Subject: Email with JSC (Operational note)
Cc: stacey.t.nakamura1@jsc.nasa.gov
Sender: owner-code-q@lists.hq.nasa.gov

Email contact with JSC SMA folks will be difficult for most of today. All people are displaced because of the memorial. Phones are set to ring at the fire house where some of the people have been temporarily located. Stacey Nakamura's email may be the only one in SMA today that is operating according to Gary Johnson. This will be rectified as people are allowed back at their desks later this afternoon.

If you have anything of a time critical nature this morning assure Stacey is also on its distribution if you transmit electronically.

Jim

sbrookov@mail.hq.nasa.gov, 02:10 PM 2/5/2003 -0500, [QS/Mullin] HATS QS/2003-00034 Update

Date: Wed, 5 Feb 2003 14:10:50 -0500 (EST)
From: sbrookov@mail.hq.nasa.gov
Subject: [QS/Mullin] HATS QS/2003-00034 Update

This is a HATS action update message. Action QS/2003-00034, CAI Disaster Funding and Donations Program, has been changed. Status has changed from Closed to Open.

From: "Kee-1, Wayne" <Wayne.M.Kee@nasa.gov>
To: "'Jonathan B. Mullin '" <jmullin@hq.nasa.gov>
Subject: RE: FW: FEMA-3171/3172-EM Situation Report #5 (February 6, 2003)
Date: Fri, 7 Feb 2003 10:26:55 -0500
X-Mailer: Internet Mail Service (5.5.2653.19)

Jon, I am being pulled back to KSC after today. Barksdale AFB on site representative for Emergency Preparedness will be Jim Cheek, 318-456-7261 BAFB Command Center. Jim is on site now. Depending on events, I may return, but will have to see how things are going.

Wayne

-----Original Message-----
From: Jonathan B. Mullin
To: HCAT@hq.nasa.gov
Cc: bdolci@mail.arc.nasa.gov; Wayne Kee; Tom Ambrose; Michael.B.Stevens@nasa.gov; jpiaseck@hq.nasa.gov; Eric.G.Fuller@jpl.nasa.gov; probles@nmo.jpl.nasa.gov; robert.t.gaffney1@jsc.nasa.gov
Sent: 2/7/2003 8:50 AM
Subject: Fwd: FW: FEMA-3171/3172-EM Situation Report #5 (February 6, 2003)

FEMA Reports. Retain close hold. Regards, Jon
>From: FEMA OPERATIONS CENTER <FEMA.OPERATIONS.CENTER@fema.gov>
>
>
>Subject: FW: FEMA-3171/3172-EM Situation Report #5 (February 6, 2003)
>Date: Thu, 6 Feb 2003 22:19:40 -0500
>X-Mailer: Internet Mail Service (5.5.2656.59)
>
>
>
> > -----Original Message-----
> > From: Snow, Don
> > Sent: Thursday, February 06, 2003 10:18 PM
> > To: Action Officer; Bearden, Joe; Black, Brenda J; Brewer, Marsha;
> > Bushnell, Jon; Castleman, Ron; Coachman, Sandy; Colley, Jack;
Colomo;
> > Russell; Crawford, Dan; Day, Don; Dochnal, Alfred; Dugan, Moises;
EOC;
> > Fairley, Wayne; FEMA OPERATIONS CENTER; Gaffney, Robert; Groening,
> > Marilyn; Hammond, Lisa; Hansen, Barry; Harmon, Richard; Hendrix,
Robert;
> > Hernandez, Justo; Johnston, Christopher; Jones, Arthur G.; Jones,
Carolyn;
> > Juenker, Sue; King, Michael; Knight, Nina; Langhelm, Ron; Lee,
Dennis;

> > Lopez, Elsa; Massimi, Linda; Matthews, Kate; Mills, Kyle; Misczak, Mark;
> > MOC, Denton; Moorehead, Carrie; Pagano, Frank; Passey, David; Penn, Billy;
> > Perrin, Dennis; R6-ROC; Rhodes, Cindy; Richardson, Ross; Roeh, William;
> > Shelton, Don; Taylor, Beverly; Tompkins, Susan; Vaughn, Steve; Wallace,
> > MarkR6
> > Subject: FEMA-3171/3172-EM Situation Report #5 (February 6, 2003)
> >
> > <<SitRep 5.doc>> <<Response Teams Chart Columbia.xls>>
> > <<ShuttleCollectionReport.xls>>
>
>

Jonathan B. Mullin
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Emergency Preparedness Coordinator
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Phone (202) 358-0589
FAX (202) 358-3104
"Mission Success Starts with Safety"
<<SitRep 5.doc>> <<Response Teams Chart Columbia.xls>>
<<ShuttleCollectionReport.xls>>

Miller, Cathy, 04:19 PM 2/1/2003 -0600, Status on Marshall's EOC 2/1/03

From: "Miller, Cathy" <Catherine.M.Miller@nasa.gov>
To: "'jmullin@hq.nasa.gov'" <jmullin@hq.nasa.gov>
Cc: "Carter, Jim (AD01)" <Jim.H.Carter@nasa.gov>
Subject: Status on Marshall's EOC 2/1/03
Date: Sat, 1 Feb 2003 16:19:34 -0600
X-Mailer: Internet Mail Service (5.5.2653.19)

Hello Jon, Marshall's EOC will be deactivating today at 4:15. The EPO will be on call. The phone number to the NASA Information Support Center (NISC) is 1-866-230-6272 and they can connect you to Marshall's employees 24/7. I also called MAF/Ernie Graham a few minutes ago and he said he will be reporting to work tomorrow at MAF.

Miller, Cathy, 12:18 PM 2/1/2003 -0600, MSFC EOC Activated at 10:30 a.m.

From: "Miller, Cathy" <Catherine.M.Miller@nasa.gov>
To: "'jmullin@hq.nasa.gov'" <jmullin@hq.nasa.gov>
Subject: MSFC EOC Activated at 10:30 a.m.
Date: Sat, 1 Feb 2003 12:18:34 -0600
X-Mailer: Internet Mail Service (5.5.2653.19)

Hello Jon, I left you an office voice mail message telling you Marshall's EOC activiated at 10:30 a.m. Our Acting EMD/Jim Carter is in the EOC. I called MAF/Ernie Graham at 11:35 to check in with him. He is at home on call.

From: "Barker-1, Charles" <David.Barker-1@nasa.gov>
To: "'stacey.t.nakamura@nasa.gov'" <stacey.t.nakamura@nasa.gov>,
"'jmullin@hq.nasa.gov'" <jmullin@hq.nasa.gov>
Cc: "Brisbin-1, Steven" <Steven.Brisbin-1@nasa.gov>
Subject: Shuttle Mishaps in SEACATS
Date: Fri, 21 Feb 2003 13:41:58 -0500
X-Mailer: Internet Mail Service (5.5.2653.19)

<<SEACATS mishaps.xls>>
Stacey,

Here is the data from the old KSC SEACATS database that we used instead of MRCAS for several years. There are two sections on the attachment, one for damage and one for injuries. If you have any questions, please let me know.

Dave Barker
321-867-6351

 SEACATS mishaps.xls

To: Brian Johnson <bjohnso2@hq.nasa.gov>
From: "Jonathan B. Mullin" <jmullin@hq.nasa.gov>
Subject: Re: IRIS
Cc:
Bcc:
Attached:

Thanks, Jon
At 08:16 AM 2/3/2003 -0500, you wrote:

Understood - any support required by Code Q as a whole will be supported. I discussed this with Jon on the train this morning.

Thanks,

Brian

At 08:08 AM 2/3/2003 -0500, Jeanette Scissum wrote:
Brian,

It is critical that the Incident Reporting Information System (IRIS) be fully operational and supported during this period of increased reporting and scrutiny following the Shuttle Mishap on Saturday, February 1.

Jeanette

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Date: Tue, 25 Feb 2003 12:54:49 -0500 (EST)
From: sbrookov@mail.hq.nasa.gov
Subject: [QS/Mullin] HATS QS/2003-00078 Assignment

This is a HATS assignment message. Action QS/2003-00078, Shuttle-Related Mishap Data om SEACAPS, has been assigned to:

Originator QS/Lloyd
Sign Off QS/Lloyd
Action Off QS/Mullin
Info Copies QS/Brookover

X-Authentication-Warning: spinoza.public.hq.nasa.gov: majordom set sender to owner-code-qs using -f
X-Sender: jlloyd@mail.hq.nasa.gov
X-Mailer: QUALCOMM Windows Eudora Version 4.3.2
Date: Fri, 28 Feb 2003 08:11:51 -0500
To: code-qe@hq.nasa.gov, code-qs@lists.hq.nasa.gov
From: James Lloyd <jlloyd@hq.nasa.gov>
Subject: KSC Presentation Charts (Bert's Brief to an Element of the CAIB on February 27)
Sender: owner-code-qs@lists.hq.nasa.gov

Anyone anxious to see the presentation charts I spoke about yesterday morning will be able later today when Bert sends me the "as-presented" charts. I will put the presentation on the "107 team" intranet working group web site.

Recall that we will have a 1 pm telecon today with the SMA Directors.

Jim

NAKAMURA, STACEY T. (JSC-NS) (NASA), 03:55 PM 2/28/2003 -0600, RE: Shuttle Search Results

From: "NAKAMURA, STACEY T. (JSC-NS) (NASA)" <stacey.t.nakamura@nasa.gov>
To: "'Jonathan B. Mullin'" <jmullin@HQ.NASA.GOV>
Subject: RE: Shuttle Search Results
Date: Fri, 28 Feb 2003 15:55:12 -0600
X-Mailer: Internet Mail Service (5.5.2653.19)

received, thx,

-
Stacey T. Nakamura
Phone: (281) 483-4345
Fax: (281) 483-6275

-----Original Message-----
From: Jonathan B. Mullin [mailto:jmullin@hq.nasa.gov]
Sent: Friday, February 28, 2003 3:22 PM
To: NAKAMURA, STACEY T. (JSC-NS) (NASA)
Cc: jhanbury@hq.nasa.gov; mvohs@hq.nasa.gov; sbrookov@hq.nasa.gov; prichard@hq.nasa.gov
Subject: Shuttle Search Results
Importance: High

Stacey, here is a bit of over kill on an IRIS inquiry that was run. If you want this paired down, let us know what parameters might be applicable. Mark Vohs indicates that there may be some duplicate records in the lot.
Regards, Jon

>From: Mark Vohs <>
>Subject: Shuttle Search Results
>Cc: joe Hanbury <jhanbury@hq.nasa.gov>, karen Wessinger
><kwessing@hq.nasa.gov>,
> mvohs@hq.nasa.gov
>
>Jon here are the results of the newest search. The new record count is 2143.
>Please let me know if you need the search modified. I've got a way of
>getting the data to you faster for the next time we need to run such a query.
>
>Thanks
>
>
>
>Mark Vohs

>Lead
>ISEM Software Development
>NASA codes A,E,G,I,J,K,Q,W,X
>Work:703-676-0281

>
>
Jonathan B. Mullin
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To: pzeender@cpia.jhu.edu
From: "Jonathan B. Mullin" <jmullin@hq.nasa.gov>
Subject: Space Shuttle Abstracts
Cc: lemke-john, jim cocchiaro
Bcc:
Attached:

Pete, I appreciate your work concerning the abstract search. This message should establish our email contact.
Regards, Jon

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Emergency Preparedness Coordinator
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Conley Perry, 12:49 PM 2/10/2003 -0500, RE: Potential Briefing of Mishap Board

To: "Conley Perry" <cpaecco@sbcglobal.net>
From: "Jonathan B. Mullin" <jmullin@hq.nasa.gov>
Subject: RE: Potential Briefing of Mishap Board
Cc:
Bcc:
Attached:

I expect Mr. Lloyd to respond to the needs that Bryan O'Connor directs.
I rustled the bushes with my follow up this morning, so we shall see where it goes.
Regards, Jon
At 10:59 AM 2/10/2003 -0600, you wrote:
I am available to support the board in any way you need. Keep me informed.

-----Original Message-----
From: Jonathan B. Mullin [mailto:jmullin@hq.nasa.gov]
Sent: Monday, February 10, 2003 10:12 AM
To: mertzcw@mertznet.com
Cc: jlloyd@hq.nasa.gov
Subject: Potential Briefing of Mishap Board

Chuck, at 1100 hours EST, February 10, 2003, I followed up with Mr. Jim

Lloyd concerning the potential briefing of the Mishap Board.

Jim indicated that he has not finalized any details with Bryan O'Connor

concerning this matter.

Could you give Mr. Lloyd a call at 202-358-0557?

Regards, Jon
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Mark Kowaleski, 12:49 PM 1/24/2003 -0500, STS-107 Status Report for January 24

X-Sender: mkowales@mail.hq.nasa.gov
X-Mailer: QUALCOMM Windows Eudora Version 4.3.2
Date: Fri, 24 Jan 2003 12:49:46 -0500
To: prutledg@mail.hq.nasa.gov, jlloyd@mail.hq.nasa.gov,
mgreenfi@mail.hq.nasa.gov, boconnor@mail.hq.nasa.gov,
wbihner@mail.hq.nasa.gov, gwhite1@mail.hq.nasa.gov,
rpatrican@hq.nasa.gov, mcard@hq.nasa.gov, prichardson@hq.nasa.gov,
fchandle@mail.hq.nasa.gov
From: Mark Kowaleski <mkowales@hq.nasa.gov>
Subject: STS-107 Status Report for January 24

The STS-107 mission continues to go well. Research activities in the SpaceHab module. comprising 80+ experiments are going well. Consumables margins continue to exceed predictions and will contribute to a higher than expected landing weight.

Analysis of the landing weight determined that it may be very close to the 233,000-pound certification limit (expected to be near 233,600 lbs). Ground controllers and the Mission Evaluation Room (MER) engineers will continue to monitor cryo consumption to better estimate end-of-mission landing weight.

At the MMT today they discussed the analysis that is taking place:
-Payload interfaces (OK) -Landing gear and tires (OK) -Steering (OK) -Thermal at bondline (TBD but expected to be OK) -Reentry trajectory (OK) -Main engine nozzle loading (TBD but expected to be OK) - also, consumables during landing phase is being reassessed.

Prior history of high landing weights:
STS-90 was right at 233K
STS-87 at 233,090
STS-83 at 235,286 (early mission termination due to fuel cell problem)

Evaluation of the debris seen in the video and film review determined that there may be significant tile damage; however, not to the extent that would result in burnthrough or catastrophic failure. The evaluation also determined that there should be no adverse effect to the RCC panels due to the angle (glancing) of potential impact predicted.

My thoughts: If the damage was any worse, we could have been looking at a real serious problem (rekindles the "on-orbit repair capability" discussion). We won't know the real extent of the damage until the orbiter comes back and we unload the detailed photographs. Leading theory is that the foam originated from the bipod ramp vicinity (this was issue for STS-112 and discussed at length at STS-113 FRR). If from bipod area, then this is 4th instance of major foam from that area (STS-112, 32, and 50). Build paper is being reviewed for the last few and next few tanks - nothing out-of-family has turned up with regard to foam application.

Mark

ERMINGER, MARK D. (JSC-NC) (NASA), 07:08 AM 1/6/2003 -0600, RE: FW: BSTRA ball test status

From: "ERMINGER, MARK D. (JSC-NC) (NASA)" <mark.d.erminger@nasa.gov>
To: "'boconnor'" <boconnor@hq.nasa.gov>
Cc: "JOHNSON, GARY W. (JSC-NA) (NASA)" <gary.w.johnson@nasa.gov>,
"JOHNSON, M. S. (SCOTT) (JSC-NC) (NASA)" <m.s.johnson@nasa.gov>,
"'H - Kowaleski Mark'" <mkowales@mail.hq.nasa.gov>,
"H - Bihner Bill (wbihner@mail.hq.nasa.gov)" <wbihner@mail.hq.nasa.gov>,
"MARTINEZ, HUGO E. (JSC-NC) (GHG)" <hugo.e.martinez1@jsc.nasa.gov>,
Pete Rutledge <prutledg@hq.nasa.gov>, mstamate@mail.hq.nasa.gov,
Amanda.Goodson@msfc.nasa.gov, Shannon.Bartell-1@ksc.nasa.gov,
"MARSHALL, YOLANDA Y. (JSC-NA) (NASA)" <yolanda.y.marshall@nasa.gov>
Subject: RE: FW: BSTRA ball test status
Date: Mon, 6 Jan 2003 07:08:48 -0600
X-Mailer: Internet Mail Service (5.5.2653.19)

I agree with you. We will do the best we can.

-----Original Message-----
From: boconnor [mailto:boconnor@hq.nasa.gov]
Sent: Friday, January 03, 2003 7:49 AM
To: ERMINGER, MARK D. (JSC-NC) (NASA); MARSHALL, YOLANDA Y. (JSC-NA) (NASA)
Cc: JOHNSON, GARY W. (JSC-NA) (NASA); JOHNSON, M. S. (SCOTT) (JSC-NC) (NASA); 'H - Kowaleski Mark'; H - Bihner Bill (wbihner@mail.hq.nasa.gov); MARTINEZ, HUGO E. (JSC-NC) (GHG); Pete Rutledge; mstamate@mail.hq.nasa.gov; Amanda.Goodson@msfc.nasa.gov; Shannon.Bartell-1@ksc.nasa.gov
Subject: Re: FW: BSTRA ball test status

Mark,
With regard to Hugo's comment about performing a PRA on the potential for FOD generation, I know it is always fair to say that we don't have the data to produce a number, but we must be able to put this issue into at least some gross range of probabilities otherwise we are not doing a risk assessment, and it is unfair to ask the PM or the FRR Board to accept risk if we don't do the best we can with a risk assessment.
My guess is that the least you can do is get a range of probabilities for FOD generation from the metallurgists, and then applying what you think the chance of catastrophic failure would be if you did generate FOD from the SSME folks. Then you should look at what affect that resultant number (including uncertainty) has on the baseline PRA. If the baseline LOC median number is 1/245 for ascent/entry, what does it become with this new failure mode? And, looking at the uncertainties, what does the new 95th and 5th percentile number become? I think this is a legitimate question for the PM to ask if he is thinking about accepting the risk for 107. And if he doesn't I will in the delta PAR.
What do we do with the numbers? Let's say the new median becomes 1/200. That's the same as taking out the new fuel turbopump. And if it goes to 1/150, that's like taking out the MCC, the LOX turbopump, the new heat exchanger and going back to major black zones in the contingency aborts (like we had in the 1980s), etc. And, if it goes all the way to 1/50, it is like being back in the old SRM and 17 inch disconnect days pre Challenger. (Don't quote me with these numbers, because I am guessing with these analogies, but I use them to show what I would want to know in a risk assessment).
Best,
O'C

At 05:57 AM 1/3/2003 -0600, ERMINGER, MARK D. (JSC-NC) (NASA) wrote:

>-----Original Message-----
>From: MARTINEZ, HUGO E. (JSC-NC) (GHG)

ERMINGER, MARK D. (JSC-NC) (NASA), 07:08 AM 1/6/2003 -0600, RE: FW: BSTRA ball test status

>Sent: Thursday, January 02, 2003 6:16 PM
>To: HATAMLEH, OMAR (JSC-NC) (SAIC); ERMINGER, MARK D. (JSC-NC) (NASA);
>JOHNSON, M. S. (SCOTT) (JSC-NC) (NASA); BROWNE, DAVID M. (JSC-NC) (NASA)
>Cc: CULBERTSON, FRANK L., JR (JSC-NA) (SAIC); CAZES, DAVID (JSC-NA)
>(SAIC); EVATT, GARVIN T. (GT) (JSC-NC) (SAIC); BALU, BRIAN K. (JSC-NC)
>(SAIC); DYER, KEITH W. (JSC-NC) (SAIC); AUGUSTYN, JOSEPH (JSC-REMOTE);
>TIPTON, MICHAEL R. (JSC-NX) (SAIC); PRINCE, GORMAN W. (BILLY) (JSC-NC)
>(GHG); ISHMAEL, MOHAMED I. (GEORGE) (JSC-NC) (SAIC); CLEMENTS, DANIEL L.
>(JSC-NC) (GHG); ALMASRI, WALEED (JSC-REMOTE); AL-HAYEK, FAREED A. (JSC-NC)
>(SAIC)
>Subject: RE: BSTRA ball test status
>
>Cracks have finally been observed in 2 of 3 balls at Huntington Beach
>using method developed at MSFC, but no conclusions can yet be drawn. FOD
>continues to be a serious discussion topic. At the meeting today with
>Ralph Roe, the Huntington Beach and MSFC test status was given, the status
>of the JSC remote tool development was presented, and thoughts on flight
>rationale were discussed.
>
>Plans are for testing to conclude Jan 8th, although a PRCB will be held on
>the 6th to discuss preliminary FRR charts for STS-107. The team will not
>report to Ralph Roe until Monday the 6th at 9:00 am unless testing over
>the weekend fails (crack does not arrest or FOD is generated). In the
>meantime, the SSME Project will have an answer on FOD tolerance (not
>expected to be good). If a naturally cracked (vs. notched) ball generates
>FOD or does not arrest, we will have a problem necessitating the
>inspection of OV-102's balls. If any other ball generates FOD or does not
>arrest, the Test #2b ball with two in-line notches can be used to prove
>arrest and no FOD generation.
>
>Huntington Beach test status:
>
>Test #1 Update: Completed incremental thermal shock at 350 F without
>cracking. Abandoned this test (this is the test where they started at 200
>F and quenched at -100 F, then incremented the initial temperature by 25
>degrees each time and quenched again) and will crack with a wedge now.
>
>Test #2a Update: During 275 F to -100 F incremental thermal shock, got
>multiple cracking about 320 degrees around. Will now subject it to
>flight-like thermal/mechanical per 4x testing. 4x testing repeats the
>nominal flight portion of test#2a three additional times in order to
>encompass 30 missions (OV-102 has seen 28 missions).
>
>Test #2b Update: Had stopped testing and put in two series "thumbnail"
>notches and put into 212 F to 32 F rapid thermal cycles. Saw a crack
>between notches, detected via eddy current, not yet visible. Will then go
>into 4x testing.
>
>MSFC Status:
>
>Both cracked 2.24" balls at MSFC are undergoing testing per HB's test #2
>plan and no crack growth has been seen. Both of these balls were
>initially cracked using a severe thermal gradient. Similarly, 1.75" and
>1.25" balls are undergoing testing per test #2. One 1.75" ball had
>cracked without a notch and without a severe thermal environment (see
>below) and has opened up a new crack via testing. The maximum length of a
>crack is 0.4 inches but shallow and stable, it appears.
>
>JSC Remote Tool Development Update:
>
>Developers claim they have "tremendous control" of ball. Some technical
>issues, such as needing more articulation, cleaning the device for use on
>the fleet, and establishing the vehicle BSTRA joint configuration are
>being worked. They are building an articulating joint at the end effector

ERMINGER, MARK D. (JSC-NC) (NASA), 07:08 AM 1/6/2003 -0600, RE: FW: BSTRA ball test status

>to address the first issue. The device will be ready this coming Sunday.
>
>Other:
>
>SRQA got an action to perform a PRA on the potential for FOD
>generation. We will be working on the feasibility of this tomorrow (Jan
>3rd). While we haven't coordinated with the PRA analysts yet, we feel
>that getting realistic numbers would not be possible with the available
data.
>
>Hugo
>
>-----Original Message-----
>
>From: MARTINEZ, HUGO E. (JSC-NC) (GHG)
>
>Sent: Wednesday, January 01, 2003 2:23 PM
>
>To: HATAMLEH, OMAR (JSC-NC) (SAIC); ERMINGER, MARK D. (JSC-NC) (NASA);
>
>JOHNSON, M. S. (SCOTT) (JSC-NC) (NASA); BROWNE, DAVID M. (JSC-NC) (NASA)
>
>Cc: CULBERTSON, FRANK L., JR (JSC-NA) (SAIC); CAZES, DAVID (JSC-NA)
>
>(SAIC); EVATT, GARVIN T. (GT) (JSC-NC) (SAIC); BALU, BRIAN K. (JSC-NC)
>
>(SAIC); DYER, KEITH W. (JSC-NC) (SAIC); AUGUSTYN, JOSEPH (JSC-REMOTE);
>
>TIPTON, MICHAEL R. (JSC-NX) (SAIC); PRINCE, GORMAN W. (BILLY) (JSC-NC)
>
>(GHG); ISHMAEL, MOHAMED I. (GEORGE) (JSC-NC) (SAIC); CLEMENTS, DANIEL L.
>
>(JSC-NC) (GHG); ALMASRI, WALEED (JSC-REMOTE); AL-HAYEK, FAREED A.
>
>(JSC-NC) (SAIC)
>
>Subject: RE: BSTRA ball test status
>
>Testing at Huntington Beach and MSFC continues, as does the development of
>thermal and stress models in an attempt to build flight rationale for
>STS-107. The generation of FOD has not at all been alleviated after
>branched cracking was detected on an MSFC ball subjected to extreme
>temperature gradients.
>
>Huntington Beach testing continues on the 3 balls in an effort to first
>create cracks and then to show arrest (no surface growth) under a repeated
>load profile. All testing described in the original email below is
>complete, but no cracks have been created. Huntington Beach is adding
>steps to their test procedure to incorporate crack initiation techniques
>developed at MSFC: the use of a dry ice/alcohol bath (-100°F) which allows
>for quicker quenching.
>
>Test #1 Update: Since dunking the notched 2.24" cabinet ball in LN2
>created no cracks (nor did boiling water to ice water thermal shocks), the
>ball is now being heated to an incrementally higher temperature and
>quenched at -100°F dry ice/alcohol. This series of thermal shocks is in
>effort to "sneak up" on the critical conditions required to crack a
>ball. The first set of 5 thermal shock cycles began at 200°F, and
>subsequent sets beginning at 225°F and 250°F yielded no cracks. As of
>December 30th, the set beginning at 275°F was in work. Plans are to
>continue incrementing the initial temperature by 25°F, running 5
>cycles. Inspections are run visually and with eddy current after the
>first and 5th cycles in each set.
>

ERMINGER, MARK D. (JSC-NC) (NASA), 07:08 AM 1/6/2003 -0600, RE: FW: BSTRA ball test status

>Test #2a Update: Taking the notched 2.24" flight spares ball through a
>series of flight-like thermal mechanical cycles described below yielded no
>cracking. The same series of thermal shocks is being used on this ball as
>in test #1 above, that is, purely thermal cycles, in an effort to crack
>it. On 200°F cycles, saw an eddy current indication and again during
>225°F cycles deep in the notch. It appears to be growing about an 1/8th
>of an inch on one edge of the notch but is not yet visible on the
>surface. Once it is seen on the surface, testing will proceed to Phase
>II, testing for crack arrest under flight-like thermal
>mechanical/loading. Eddy current and visual inspections are being
>conducted after every cycle at this time. Testing is now in the set of 5
>cycles at 250°F, but so far no surface cracks have appeared.
>
>Test #2b Update: Taking the second 2.24" flight spares ball (without a
>notch) through a series of flight-like thermal mechanical cycles described
>below yielded no cracking. In an effort to expedite the creation of a
>crack, two in-line notches are being EDM'd into the ball, approximately
>0.050" between them. The ball with then be subjected to a total of 1000
>rapid thermal cycles from boiling water to ice water in an effort to crack
>it before resuming flight-like thermal/mechanical cycling.
>
>MSFC Status: Besides developing a technique for quicker quenching, MSFC
>personnel have cracked both notched and pristine 2.24" balls using severe
>thermal cycles. In addition, they have cracked a flight spares ball (one
>of 1.75" diameter, without a notch, that had pre-existing subsurface
>flaws) with nominal thermal cycles (from ambient to LN2
>temperature). Because of the similarity between LN2 temperature and LO2's
>temperature (flight temperature), cracking of the 1.75" ball lends
>credibility to the theory that the OV-103 ball might have had subsurface
>cracks which surfaced when subjected to cryogenic cycles. Note however
>that the test does not simulate the thermal mass and mechanical loading
>seen on the flight vehicle during loading and flight. Secondly, the fact
>that a flight spares ball had subsurface defects which propagated to a
>surface crack tends to indict the acceptance criteria.
>
>The concern of particle liberation upstream of an SSME has been fueled by
>the type of cracking detected on the severely cracked 2.24"
>balls. Coordination with the SSME Project on the engine's tolerance to
>FOD is being conducted in an attempt to clear this concern.
>
>Thermal modeling indicates that LN2 is not a good test fluid for balls in
>LH2 service (1.25"). If liquid hydrogen is used to simulate these
>conditions, safety considerations will slow testing significantly. Other
>mediums, such as liquid helium and liquid neon, are being
>considered. Note that the thermal modeling so far has considered only the
>ball. Model development is in work on the inserts and adjoining hardware.
>
>NDE of all flight spares is being conducted in an effort to find more
>balls with subsurface indications. These would then be put in
>test. Finding no indications in any of the flight spares might support
>the theory that OV-103's ball was an outlier, i.e., that it had subsurface
>cracks when installed in the line.
>
>More to come.
>
>Hugo
>
>-----Original Message-----
>
>From: HATAMLEH, OMAR (JSC-NC) (SAIC)
>
>To: ERMINGER, MARK D. (JSC-NC) (NASA); JOHNSON, M. S. (SCOTT) (JSC-NC)
>(NASA); BROWNE, DAVID M. (JSC-NC) (NASA)
>

ERMINGER, MARK D. (JSC-NC) (NASA), 07:08 AM 1/6/2003 -0600, RE: FW: BSTRA ball test status

>Cc: CULBERTSON, FRANK L., JR (JSC-NA) (SAIC); CAZES, DAVID (JSC-NA)
>(SAIC); EVATT, GARVIN T. (GT) (JSC-NC) (SAIC); BALU, BRIAN K. (JSC-NC)
>(SAIC); DYER, KEITH W. (JSC-NC) (SAIC); AUGUSTYN, JOSEPH (JSC-REMOTE);
>MARTINEZ, HUGO E. (JSC-NC) (GHG); TIPTON, MICHAEL R. (JSC-NX) (SAIC);
>PRINCE, GORMAN W. (BILLY) (JSC-NC) (GHG); ISHMAEL, MOHAMED I. (GEORGE)
>(JSC-NC) (SAIC); CLEMENTS, DANIEL L. (JSC-NC) (GHG); ALMASRI, WALEED
>(JSC-REMOTE); AL-HAYEK, FAREED A. (JSC-NC) (SAIC)
>
>Sent: 12/27/2002 6:10 PM
>
>Subject: RE: BSTRA ball test status
>
>Cryogenic load testing in Huntington Beach is continuing on three
>
>separate 2.24" BSTRA balls in order to help build flight rationale. Test
>
>1, and 2a are still in progress with no crack indications so far. Test
>
>2b has been completed with no crack indications. Test 2b indicates that
>
>a flight ball, when subjected to a single mission's worth of cryo and
>
>mechanical combined loading, does not crack.
>
>In addition to the Huntington Beach testing, MSFC is working on a method
>
>of cracking a ball thermally to be used in the event that a crack cannot
>
>be initiated via the current Huntington Beach test procedure. MSFC was
>
>successful in cracking balls under severe conditions (300 F to -100 F in
>
>one case and 400 F to -100 F in another case). The crack extends about
>
>280 degrees around on one ball, and a little less on another ball.
>
>Another interesting feature was the production of intersecting cracks,
>
>which could ultimately lead to FOD.
>
>MSFC sectioned a 2.25" ball purchased from the Oregon vendor and found a
>
>large porosity site ("big enough to stick a pencil in") near the center.
>
>These Oregon balls were produced much later and have process
>
>improvements which should help eliminate porosity. This data tends to
>
>indicate that porosity is probably to be found in most cast balls. In
>
>addition, metallurgy shows a finer grain structure in the middle and
>
>coarser towards the surface.
>
>Updates to the JSC activities will be provided in a separate email note.
>
>The next meeting is scheduled for Monday at a time to be disclosed
>
>later.
>
> > -----Original Message-----
>
> >From: MARTINEZ, HUGO E. (JSC-NC) (GHG)
>

ERMINGER, MARK D. (JSC-NC) (NASA), 07:08 AM 1/6/2003 -0600, RE: FW: BSTRA ball test status

> >Sent: Monday, December 23, 2002 1:44 PM
>
> >To: BROWNE, DAVID M. (JSC-NC) (NASA); CULBERTSON, FRANK L., JR
>
> >(JSC-NA) (SAIC); CAZES, DAVID (JSC-NA) (SAIC); EVATT, GARVIN T. (GT)
>
> >(JSC-NC) (SAIC); DYER, KEITH W. (JSC-NC) (SAIC); JOHNSON, M. S. (SCOTT)
>
> >(JSC-NC) (NASA); ERMINGER, MARK D. (JSC-NC) (NASA); ALMASRI, WALEED;
>
> >BALU, BRIAN; CLEMENTS, DANIEL; HATAMLEH, OMAR; ISHMAEL, MOHAMED;
>
> >jaugust0; PRINCE, GORMAN; TIPTON, MICHAEL
>
> >Subject: BSTRA ball test status
>
> >
>
> >Execute summary: Cryogenic load testing in Huntington Beach began
>
> >Friday, December 20th on three separate 2.24" BSTRA balls in order to
>
> >help build flight rationale. These three tests, which are being run in
>
> >parallel, attempt to prove the theory that cracks will develop and then
>
> >arrest prior to going completely through a ball. Partly into the tests
>
> >this morning, no cracks have conclusively been observed, although one
>
> >faint indication is being inspected further. In addition, another
>
> >ball, a flight spares of a smaller size, was eddy current inspected and
>
> >found to have subsurface indications not detetable with dye pen and
>
> >visual checks. Testing will continue today and will resume on the
>
> >evening of the 26th.
>
> >
>
> >Test #1: 2.24" ball, notch in ball, instrumented. Purpose is to help
>
> >validate computer model by assessing residual stresses and thermal
>
> >response. Have completed first 5 thermal cycles from ambient to LN2
>
> >(-320F), and there appears a faint line or shadow in the notch near one
>
> >end being inspected further to confirm or deny a crack. Continued with
>
> >6th thermal cycles (this second set of 5 cycles is from 200 F to LN2)
>
> >until a crack is confirmed. If no cracks develop at the conclusion of
>
> >these 10 cycles, a more severe method of creating a crack will be
>
> >developed. If a crack develops, the same temperature cycle will be
>
> >repeated until the ball fails or the crack arrests. The more severe
>
> >method, which is under development as a contingency, could use boiling
>

ERMINGER, MARK D. (JSC-NC) (NASA), 07:08 AM 1/6/2003 -0600, RE: FW: BSTRA ball test status

> >water and an alcohol/dry ice bath to produce a much higher temperature
>
> >gradient.
>
> >
>
> >Test #2a: 2.24" ball in flight-like cups, notch in ball, not
>
> >instrumented*, mechanical load cycling while in LN2 bath: Purpose of
>
> >test is to show crack growth and subsequent arrest while under
>
> >flight-like thermal and mechanical loads. Briefly, the test is
>
> >scheduled to:
>
> >1. Simulate nominal loads seen during propellant loading (11,000 lbs
>
> >applied and removed while in LN2 bath) for 5 cycles, then inspect.
>
> >2. Simulate nominal loads seen during flight (41,000 lbs applied and
>
> >removed while in LN2 bath) for 30 cycles, then inspect.
>
> >3. Apply margin loads above nominal flight loads (49,000 applied and
>
> >removed while in LN2 bath) for 5 cycles, then inspect.
>
> >4. Apply margin loads above nominal flight loads (61,000 applied and
>
> >removed while in LN2 bath) for 5 cycles, then inspect.
>
> >5. Apply margin loads above nominal flight loads (71,000 applied and
>
> >removed while in LN2 bath) for 5 cycles, then inspect.
>
> >
>
> >Currently, test #2a is 3 cycles into the 41,000 lbs testing, with no
>
> >cracks visible after the 11,000 testing was completed. As in test #1,
>
> >testing will continue until a crack develops / arrests. Inspections
>
> >are visual after every cycle, and eddy current after every 5th cycle.
>
> >*Instrumentation removed.
>
> >
>
> >Test #2b: Same as #2a, but without notch in ball: Purpose of test is
>
> >to show crack initiation, growth and subsequent crack arrest while
>
> >under flight-like thermal and mechanical loads, but on a pristine ball
>
> >which more closely resembles flight balls. The test sequence is the
>
> >same as in Test #2a:
>
> >
>
> >The 35 nominal cycles are complete (5 cycles at 11,000 lbs plus 30
>

> >cycles at 41,000 lbs), and margin testing has commenced for a total of
>
> >43 cycles so far. There are no indications of a crack via visual or
>
> >eddy current at this time.
>
> >
>
> >MSFC activity:
>
> >In addition to the Huntington Beach testing, MSFC is working on
>
> >metallography of balls of various sizes in order to rationalize
>
> >extrapolating these results to the different size balls used in the
>
> >Orbiter (2.24", 1.75", and 1.25"). In addition, MSFC is working on a
>
> >method of cracking a ball thermally to be used in the event that a
>
> >crack cannot be initiated via the current test procedure. Finally,
>
> >MSFC reports finding an eddy current indication in a flight spares ball
>
> >(of 1.25" diameter), an indication which is invisible via visual and
>
> >dye pen. This "crack" must be subsurface and may be a cluster of
>
> >porosity. Since this ball was extracted from flight spares and may
>
> >have a crack, this tends to indict the acceptance screening process.
>
> >MSFC personnel believe that there are large variations in
>
> >microstructure between individual balls. However, even with
>
> >variations, the testing being conducted at Huntington Beach will likely
>
> >show crack arrest regardless of initial crack existence.
>
> >
>
> >JSC Activity: Mike Tipton has been working closely JSC Engineering and
>
> >shop support in the development of tools for inspecting 100% of the
>
> >ball surface in an installed line. Ideally, both crack location (via
>
> >eddy current) and depth (with Ultrasonic techniques, perhaps) can be
>
> >achieved on the fleet feedlines without requiring removal of the lines.
>
> >
>
> >Testing will continue throughout the day today and will resume shortly
>
> >after Christmas (on the evening of the 26th). The next test status
>
> >will be presented Friday, December 27th at 3:00 pm.
>
> >
>
> >Hugo E. Martinez, PE
>

ERMINGER, MARK D. (JSC-NC) (NASA), 07:08 AM 1/6/2003 -0600, RE: FW: BSTRA ball test status

> >Shuttle SR&QA Propulsion & Power Lead Engineer
>
> >JSC NC62
>
> >Phone: 281 244-1974
>
> >
>
> >Fax: 281 244-1849
>
> >
>
> >Providing for a safer tomorrow, today.
>
> >

William Hill, 08:31 PM 1/8/2003 -0500, Re: Fwd: FW: Update on BSTRA's, 1/7/03

X-Sender: whill@mail.hq.nasa.gov
X-Mailer: QUALCOMM Windows Eudora Version 4.3.2
Date: Wed, 08 Jan 2003 20:31:00 -0500
To: Bill Bihner <wbihner@hq.nasa.gov>, "Bryan O'Connor" <boconnor@hq.nasa.gov>
From: William Hill <whill@hq.nasa.gov>
Subject: Re: Fwd: FW: Update on BSTRA's, 1/7/03
Cc: Pete Rutledge <prutledg@hq.nasa.gov>,
Mark Kowaleski <mkowales@hq.nasa.gov>

Bill,

This answer (1) did not correctly get at what I asked. I asked how many balls were rejected through this process. I understand that this process could and most likely did not screen out balls that we would now, with much improved NDE techniques such as CT scan, fail. How many did the original technique screen out as bad using the LN2 dip followed by the dye penetrant inspection of the surface?

v/r

Bill Hill

At 11:13 AM 1/8/2003 -0500, Bill Bihner wrote:
Bryan,

This just in from JSC. I also just finished speaking with Hugo Martinez concerning the information below and the questions you had yesterday at the PAR.

Concerning the note below, the only good news is that the ball has held together, but FOD is now THE issue. MSFC is doing a CT scan on the ball mentioned below to get more information about the depth of the crack. In a separate call to Doug Whitehead, he told me (following a conversation with Ralph Roe) that the additional cracks started after 75 test cycles. In addition to the CT scan on this ball (which they will continue to test) they are going to cut apart other spare balls that were found with cracks to see if they can learn anything about crack propagation and/or FOD generation.

Concerning your questions yesterday, here is a brief reply to each.

1. Acceptance Test Procedures for the BSTRA Balls. Hugo believes the Orbiter project did a qual test on the BSTRA balls in the late 1970s (he has not seen a specific document). He believes they used either GN2 to cool the balls or dipped them in LN2 and then did dye penetration analysis. They did find cracks using this technique but believed that with proper screening they could still flight qual the balls.

2. What is the status of the failure mode analysis? Now, it's all in question since they did not believe they would get additional cracking without additional energy applied. The implications on FOD generation are a tremendous concern.

3. What Hazard Analysis (FMEA/CIL) data is available? There is only an analysis on the feedline, and not on the BSTRA balls themselves.

4. How is this related to the "big bang?" The "big bang was associated with the STS-57/OV-105 flow. Hugo said that the source of the noise was not in a structural failure of the BSTRA feedline system. They believe that it was associated with the H2 side T-0 umbilical and the TSM on the MLP. A carrier plate hung up and produced the noise.

There will be a telecon with the BSTRA test team this evening at 6:00 pm Eastern. I will probably still be enroute to Florida, but Doug Whitehead will attend and will phone me with a status after the call. We will get you any significant info from this telecon before you leave on travel on Thursday.

Bill

From: "ERMINGER, MARK D. (JSC-NC) (NASA)" <mark.d.erminger@nasa.gov>
To: "MARSHALL, YOLANDA Y. (JSC-NA) (NASA)" <yolanda.y.marshall@nasa.gov>
Cc: "H - Kowaleski Mark (E-mail)" <mkowales@mail.hq.nasa.gov>,
"H - Bihner Bill (E-mail)" <wbihner@mail.hq.nasa.gov>,
"JOHNSON, M. S. (SCOTT) (JSC-NC) (NASA)" <m.s.johnson@nasa.gov>,
"MARTINEZ, HUGO E. (JSC-NC) (GHG)" <hugo.e.martinez1@jsc.nasa.gov>
Subject: FW: Update on BSTRA's, 1/7/03
Date: Wed, 8 Jan 2003 09:00:23 -0600
X-Mailer: Internet Mail Service (5.5.2653.19)

-----Original Message-----
From: MARTINEZ, HUGO E. (JSC-NC) (GHG)
Sent: Tuesday, January 07, 2003 6:38 PM
To: ERMINGER, MARK D. (JSC-NC) (NASA); EVATT, GARVIN T. (GT) (JSC-NC) (SAIC); CAZES, DAVID (JSC-NA) (SAIC); CULBERTSON, FRANK L., JR (JSC-NA) (SAIC); JOHNSON, M. S. (SCOTT) (JSC-NC) (NASA); BROWNE, DAVID M. (JSC-NC) (NASA); SCHICK, TIMOTHY D. (JSC-NC) (SAIC); BOYER, ROGER L. (JSC-NC) (SAIC); ALMASRI, WALEED; BALU, BRIAN; CLEMENTS, DANIEL; HATAMLEH, OMAR; ISHMAEL, MOHAMED; jaugust0; PRINCE, GORMAN; TIPTON, MICHAEL
Subject: FW: Update on BSTRA's, 1/7/03

Here's a summary, thanks to MOD. Big news in the FOD area (and crack arrest, in my mind): we got branching cracks to the original crack in the virgin 1.75" ball at MSFC (the one that had subsurface defects prior to testing and was then cracked with about 12 thermal cycles in LN2). Worse yet, the cracks have islands in them. CT scan and mag visuals are in work to quantify and qualify. As J.C. mentions in his note below, Ralph took a second look at flight rationale today in this noon brainstorming session. We agreed there's not much to go on and PRA became second in importance only to the lab work at MSFC starting tomorrow afternoon. Roger Boyer, Tim Schick and I will be at MSFC tomorrow-Friday (at least) for the metallugical evaluation, which will be used in our PRA. I don't agree with the statement J.C. makes that "crack arrest is still looking favorable" since these extra cracks occurred long after we thought arrest had occurred.

Hugo

-----Original Message-----
From: MELCHER, JOHN C. (JSC-DF55) (NASA)
Sent: Tuesday, January 07, 2003 3:39 PM
To: MELCHER, JOHN C. (JSC-DF55) (NASA); DL DF Shuttle Management; DL DF Station Management; ANTONELLI, DOMINIC A. (JSC-CB) (NASA); HARPOLD, JON C. (JSC-DA) (NASA); JACKSON, KAREN E. (JSC-DA) (NASA); CASTLE, ROBERT E. (BOB) (JSC-DA8) (NASA); HEFLIN, JAMES M., JR (MILT) (JSC-DA8) (NASA); KNIGHT, NORMAN D. (JSC-DA8) (NASA); SHANNON, JOHN P. (JSC-DA8) (NASA); BRISCOE, ALAN L. (LEE) (JSC-DA) (NASA); HEFLIN, JAMES M., JR (MILT) (JSC-DA8) (NASA); HALE, N. W., JR (WAYNE) (JSC-DA8) (NASA); MAYER, FRED F. (JSC-NC) (SAIC); MARTINEZ, HUGO E. (JSC-NC) (GHG); STICH, J. S. (STEVE) (JSC-DA8) (NASA); CAIN, LEROY E. (JSC-DA8) (NASA); KOERNER, CATHERINE A. (CATHY) (JSC-DA8) (NASA); BECK, KELLY B. (JSC-DA8) (NASA); SCHNEIDER, GAIL A. (JSC-DA8) (NASA); LEGLER, ROBERT D. (JSC-DA8) (USA); DAVIS, PATRICIA L. (JSC-DA8) (USA); ENGELAUF, PHILIP L. (JSC-DA8) (NASA)
Cc: 'gregory.s.holden@boeing.com'; ARNOLD, THOMAS M. (JSC-DF511) (USA); EYRE, ANTHONY J. (JSC-DF55) (USA); LANE, WILLIAM F. (JSC-DF) (NASA); LEMAN, CHRISTOPHER L. (JSC-DF511) (USA); MOREHEAD, ROBERT L. (JSC-DF55) (USA); MUSLER, JEFFREY L. (JSC-DF55) (NASA); PATEL, MUNISH P. (JSC-DF55) (NASA); REDING, JON D. (JSC-DF511) (USA)
Subject: Update on BSTRA's, 1/7/03

William Hill, 08:31 PM 1/8/2003 -0500, Re: Fwd: FW: Update on BSTRA's, 1/7/03

Good afternoon.

The BSTRA status / plan of action has changed since last evening's PRCB. At the meeting this afternoon with Ralph Roe, it was reported that another test ball has cracked under nominal flight-like thermal/mechanical loads. This new crack with islands (FOD potential) and branching has essentially eliminated the notion that we could envelope the flight conditions with the balls that cracked and generated FOD in more severe conditions. The good news is that demonstrating crack arrest is still looking favorable.

NEW FLIGHT RATIONALE FOR FOD:

In addition to demonstrating crack-arrest, flight rationale will now have to assume FOD and then work around a size probability distribution as follows:
1) The cracked balls can generate FOD.
2) STILL NEEDS TO BE PROVEN: The FOD releases in small pieces that are an order of magnitude smaller than the max limit determined by the SSME project.
AND/OR
3) The Probability Risk Assessment (PRA) says ____ is the probability of a crack forming, branching with islands, and releasing FOD larger than the max allowable size.

FUTURE TEST PLAN:

1) After the balls at MSFC are complete with the "2a + 90" nominal load profile and the surface traction study, the plan is to cut open the balls and study the roots of the material islands before they generate FOD. The FOD appears to release in small pieces possibly due to the sub-surface carbide structure breaking up the islands under loading.
2) The are three additional balls at MSFC that have subsurface flaws found by CT scan / eddy current. These balls are going to get put into an LN2 dunking program in order to generate cracks with islands.
3) The balls with crack islands that are not cut open for evaluation will be run through mechanical cycling until FOD is generated. The mechanical-only cycles can be accomplished faster and will allow the capture of released material.

J.C. Melcher
Booster Systems Group, DF55
office: 281-244-6427

-----Original Message-----
From: MELCHER, JOHN C. (JSC-DF55) (NASA)
Sent: Monday, January 06, 2003 3:31 PM
Subject: BSTRA Charts for 1/6/03 PRCB

Attached here are the charts for this afternoon's PRCB at 4pm to discuss the BSTRA ball cracks. Sorry for any duplicates.

The big news from the weekend is that a second 1.75" diameter test ball has cracked under less severe temperature gradients. This is the second test ball that appears to have cracked due to sub-surface porosity, and it raises questions about how the temperature gradients and material porosity play

into the cracking mechanism. This kind of sub-surface defect would have been undetectable during 1970's orbiter acceptance testing without CT Scanning or eddy-current inspections. The good news for today is that the cracks do not seem to grow in any of the test balls after the initial rounds of load cycling, which means that testing may eventually demonstrate crack arrest. However, the FOD generation and probability issue still needs a lot more work since it is the unknown crack mechanism that drives the FOD issue.

Think Safe, Be Safe
NASA's New Vision: To improve life here,
to extend life to there,to find life beyond.
NASA's new Mission Statement:
To understand and protect our home planet
To explore the universe and search for life
To inspire the next generation of explorers
....as only NASA can.

boconnor, 08:49 AM 1/3/2003 -0500, Re: FW: BSTRA ball test status

X-Sender: boconnor@mail.hq.nasa.gov
X-Mailer: QUALCOMM Windows Eudora Version 4.3.2
Date: Fri, 03 Jan 2003 08:49:23 -0500
To: "ERMINGER, MARK D. (JSC-NC) (NASA)" <mark.d.erminger@nasa.gov>,
"MARSHALL, YOLANDA Y. (JSC-NA) (NASA)" <yolanda.y.marshall@nasa.gov>
From: boconnor <boconnor@hq.nasa.gov>
Subject: Re: FW: BSTRA ball test status
Cc: "JOHNSON, GARY W. (JSC-NA) (NASA)" <gary.w.johnson@nasa.gov>,
"JOHNSON, M. S. (SCOTT) (JSC-NC) (NASA)" <m.s.johnson@nasa.gov>,
"'H - Kowaleski Mark'" <mkowales@mail.hq.nasa.gov>,
"H - Bihner Bill (wbihner@mail.hq.nasa.gov)" <wbihner@mail.hq.nasa.gov>,
"MARTINEZ, HUGO E. (JSC-NC) (GHG)" <hugo.e.martinez1@jsc.nasa.gov>,
Pete Rutledge <prutledg@hq.nasa.gov>, mstamate@mail.hq.nasa.gov,
Amanda.Goodson@msfc.nasa.gov, Shannon.Bartell-1@ksc.nasa.gov
X-MIME-Autoconverted: from quoted-printable to 8bit by bolg.public.hq.nasa.gov id IAA15959

Mark,
With regard to Hugo's comment about performing a PRA on the potential for FOD generation, I know it is always fair to say that we don't have the data to produce a number, but we must be able to put this issue into at least some gross range of probabilities otherwise we are not doing a risk assessment, and it is unfair to ask the PM or the FRR Board to accept risk if we don't do the best we can with a risk assessment.
My guess is that the least you can do is get a range of probabilities for FOD generation from the metallurgists, and then applying what you think the chance of catastrophic failure would be if you did generate FOD from the SSME folks. Then you should look at what affect that resultant number (including uncertainty) has on the baseline PRA. If the baseline LOC median number is 1/245 for ascent/entry, what does it become with this new failure mode? And, looking at the uncertainties, what does the new 95th and 5th percentile number become? I think this is a legitimate question for the PM to ask if he is thinking about accepting the risk for 107. And if he doesn't I will in the delta PAR.
What do we do with the numbers? Let's say the new median becomes 1/200. That's the same as taking out the new fuel turbopump. And if it goes to 1/150, that's like taking out the MCC, the LOX turbopump, the new heat exchanger and going back to major black zones in the contingency aborts (like we had in the 1980s), etc. And, if it goes all the way to 1/50, it is like being back in the old SRM and 17 inch disconnect days pre Challenger. (Don't quote me with these numbers, because I am guessing with these analogies, but I use them to show what I would want to know in a risk assessment).
Best,
O'C

At 05:57 AM 1/3/2003 -0600, ERMINGER, MARK D. (JSC-NC) (NASA) wrote:

-----Original Message-----
From: MARTINEZ, HUGO E. (JSC-NC) (GHG)
Sent: Thursday, January 02, 2003 6:16 PM
To: HATAMLEH, OMAR (JSC-NC) (SAIC); ERMINGER, MARK D. (JSC-NC) (NASA); JOHNSON, M. S. (SCOTT) (JSC-NC) (NASA); BROWNE, DAVID M. (JSC-NC) (NASA)
Cc: CULBERTSON, FRANK L., JR (JSC-NA) (SAIC); CAZES, DAVID (JSC-NA) (SAIC); EVATT, GARVIN T. (GT) (JSC-NC) (SAIC); BALU, BRIAN K. (JSC-NC) (SAIC); DYER, KEITH W. (JSC-NC) (SAIC); AUGUSTYN, JOSEPH (JSC-REMOTE); TIPTON, MICHAEL R. (JSC-NX) (SAIC); PRINCE, GORMAN W. (BILLY) (JSC-NC) (GHG); ISHMAEL, MOHAMED I. (GEORGE) (JSC-NC) (SAIC); CLEMENTS, DANIEL L. (JSC-NC) (GHG); ALMASRI, WALEED (JSC-REMOTE); AL-HAYEK, FAREED A. (JSC-NC) (SAIC)
Subject: RE: BSTRA ball test status

Cracks have finally been observed in 2 of 3 balls at Huntington Beach using method developed at MSFC, but no conclusions can yet be drawn. FOD continues to be a serious discussion topic. At the meeting today with Ralph Roe, the Huntington Beach and MSFC test status was given, the status of the JSC remote tool development was presented, and thoughts on flight rationale were discussed.

Plans are for testing to conclude Jan 8th, although a PRCB will be held on the 6th to discuss preliminary FRR charts for STS-107. The team will not report to Ralph Roe until Monday the

6th at 9:00 am unless testing over the weekend fails (crack does not arrest or FOD is generated). In the meantime, the SSME Project will have an answer on FOD tolerance (not expected to be good). If a naturally cracked (vs. notched) ball generates FOD or does not arrest, we will have a problem necessitating the inspection of OV-102's balls. If any other ball generates FOD or does not arrest, the Test #2b ball with two in-line notches can be used to prove arrest and no FOD generation.

Huntington Beach test status:

Test #1 Update: Completed incremental thermal shock at 350 F without cracking. Abandoned this test (this is the test where they started at 200 F and quenched at -100 F, then incremented the initial temperature by 25 degrees each time and quenched again) and will crack with a wedge now.

Test #2a Update: During 275 F to -100 F incremental thermal shock, got multiple cracking about 320 degrees around. Will now subject it to flight-like thermal/mechanical per 4x testing. 4x testing repeats the nominal flight portion of test#2a three additional times in order to encompass 30 missions (OV-102 has seen 28 missions).

Test #2b Update: Had stopped testing and put in two series "thumbnail" notches and put into 212 F to 32 F rapid thermal cycles. Saw a crack between notches, detected via eddy current, not yet visible. Will then go into 4x testing.

MSFC Status:

Both cracked 2.24" balls at MSFC are undergoing testing per HB's test #2 plan and no crack growth has been seen. Both of these balls were initially cracked using a severe thermal gradient. Similarly, 1.75" and 1.25" balls are undergoing testing per test #2. One 1.75" ball had cracked without a notch and without a severe thermal environment (see below) and has opened up a new crack via testing. The maximum length of a crack is 0.4 inches but shallow and stable, it appears.

JSC Remote Tool Development Update:

Developers claim they have "tremendous control" of ball. Some technical issues, such as needing more articulation, cleaning the device for use on the fleet, and establishing the vehicle BSTRA joint configuration are being worked. They are building an articulating joint at the end effector to address the first issue. The device will be ready this coming Sunday.

Other:

SRQA got an action to perform a PRA on the potential for FOD generation. We will be working on the feasibility of this tomorrow (Jan 3rd). While we haven't coordinated with the PRA analysts yet, we feel that getting realistic numbers would not be possible with the available data.

Hugo

-----Original Message-----

From: MARTINEZ, HUGO E. (JSC-NC) (GHG)

Sent: Wednesday, January 01, 2003 2:23 PM

To: HATAMLEH, OMAR (JSC-NC) (SAIC); ERMINGER, MARK D. (JSC-NC) (NASA);

JOHNSON, M. S. (SCOTT) (JSC-NC) (NASA); BROWNE, DAVID M. (JSC-NC) (NASA)

Cc: CULBERTSON, FRANK L., JR (JSC-NA) (SAIC); CAZES, DAVID (JSC-NA)

(SAIC); EVATT, GARVIN T. (GT) (JSC-NC) (SAIC); BALU, BRIAN K. (JSC-NC)

(SAIC); DYER, KEITH W. (JSC-NC) (SAIC); AUGUSTYN, JOSEPH (JSC-REMOTE);

boconnor, 08:49 AM 1/3/2003 -0500, Re: FW: BSTRA ball test status

TIPTON, MICHAEL R. (JSC-NX) (SAIC); PRINCE, GORMAN W. (BILLY) (JSC-NC) (GHG); ISHMAEL, MOHAMED I. (GEORGE) (JSC-NC) (SAIC); CLEMENTS, DANIEL L. (JSC-NC) (GHG); ALMASRI, WALEED (JSC-REMOTE); AL-HAYEK, FAREED A. (JSC-NC) (SAIC)

Subject: RE: BSTRA ball test status

Testing at Huntington Beach and MSFC continues, as does the development of thermal and stress models in an attempt to build flight rationale for STS-107. The generation of FOD has not at all been alleviated after branched cracking was detected on an MSFC ball subjected to extreme temperature gradients.

Huntington Beach testing continues on the 3 balls in an effort to first create cracks and then to show arrest (no surface growth) under a repeated load profile. All testing described in the original email below is complete, but no cracks have been created. Huntington Beach is adding steps to their test procedure to incorporate crack initiation techniques developed at MSFC: the use of a dry ice/alcohol bath (-100°F) which allows for quicker quenching.

Test #1 Update: Since dunking the notched 2.24" cabinet ball in LN2 created no cracks (nor did boiling water to ice water thermal shocks), the ball is now being heated to an incrementally higher temperature and quenched at -100°F dry ice/alcohol. This series of thermal shocks is in effort to "sneak up" on the critical conditions required to crack a ball. The first set of 5 thermal shock cycles began at 200°F, and subsequent sets beginning at 225°F and 250°F yielded no cracks. As of December 30th, the set beginning at 275°F was in work. Plans are to continue incrementing the initial temperature by 25°F, running 5 cycles. Inspections are run visually and with eddy current after the first and 5th cycles in each set.

Test #2a Update: Taking the notched 2.24" flight spares ball through a series of flight-like thermal mechanical cycles described below yielded no cracking. The same series of thermal shocks is being used on this ball as in test #1 above, that is, purely thermal cycles, in an effort to crack it. On 200°F cycles, saw an eddy current indication and again during 225°F cycles deep in the notch. It appears to be growing about an 1/8th of an inch on one edge of the notch but is not yet visible on the surface. Once it is seen on the surface, testing will proceed to Phase II, testing for crack arrest under flight-like thermal mechanical/loading. Eddy current and visual inspections are being conducted after every cycle at this time. Testing is now in the set of 5 cycles at 250°F, but so far no surface cracks have appeared.

Test #2b Update: Taking the second 2.24" flight spares ball (without a notch) through a series of flight-like thermal mechanical cycles described below yielded no cracking. In an effort to expedite the creation of a crack, two in-line notches are being EDM'd into the ball, approximately 0.050" between them. The ball with then be subjected to a total of 1000 rapid thermal cycles from boiling water to ice water in an effort to crack it before resuming flight-like thermal/mechanical cycling.

MSFC Status: Besides developing a technique for quicker quenching, MSFC personnel have cracked both notched and pristine 2.24" balls using severe thermal cycles. In addition, they have cracked a flight spares ball (one of 1.75" diameter, without a notch, that had pre-existing subsurface flaws) with nominal thermal cycles (from ambient to LN2 temperature). Because of the similarity between LN2 temperature and LO2's temperature (flight temperature), cracking of the 1.75" ball lends credibility to the theory that the OV-103 ball might have had subsurface cracks which surfaced when subjected to cryogenic cycles. Note however that the test does not simulate the thermal mass and mechanical loading seen on the flight vehicle during loading and flight. Secondly, the fact that a flight spares ball had subsurface defects which propagated to a surface crack tends to indict the acceptance criteria.

The concern of particle liberation upstream of an SSME has been fueled by the type of cracking detected on the severely cracked 2.24" balls. Coordination with the SSME Project on the engine's tolerance to FOD is being conducted in an attempt to clear this concern.

Thermal modeling indicates that LN2 is not a good test fluid for balls in LH2 service (1.25"). If liquid hydrogen is used to simulate these conditions, safety considerations will slow testing