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

X-Sender: jmullin@mail.hq.nasa.gov
X-Mailer: QUALCOMM Windows Eudora Version 4.3.2
Date: Fri, 28 Feb 2003 11:24:10 -0500
To: hcat@hq.nasa.gov
From: "Jonathan B. Mullin" <jmullin@hq.nasa.gov>
Subject: Fwd: FEMA Emergency Support Team (White EST)
Cc: jlloyd@hq.nasa.gov, prichard@hq.nasa.gov, jlemke@hq.nasa.gov,
Arthur.Lee@hq.nasa.gov, jlyver@hq.nasa.gov

For your information, Code QS spoke to FEMA, Mr. Pleasant Mann at 202-646-3161 concerning the stand down of the FEMA EST which is cited in the message below.

Mr. Mann indicated that the functions of the EST that related to the "Columbia" activity would now be worked through the individual offices at FEMA, not though a formal EST.

Regards, Jon
From: FEMA OPERATIONS CENTER <FEMA.OPERATIONS.CENTER@fema.gov>
To: "ESF-01 DOT (E-mail)" <janet.benini@rspa.dot.gov>,
"ESF-02 NCS (E-mail)" <NCS@ncs.gov>, ESF-02 NCS Herr <herrf@ncs.gov>,
"ESF-02 NCS Perry (E-mail)" <perryc@ncs.gov>,
"ESF-02-NCS Oconnor (E-mail)" <oconnorj@ncs.gov>,
"ESF-04 USDA/FS Latapie (E-mail)" <blatapie@fs.fed.us>,
ESF-04 USDA/FS Schultie <jschultie@fs.fed.us>,
ESF-04 USDA/FS Terry
<bterry@fs.fed.us>,
"ESF-05 FEMA Murray (E-mail)" <john.muarry@fema.gov>,
"ESF-05 FEMA Price (E-mail)" <Bruce.Price@fema.gov>,
"ESF-06 ARC Blystad (E-mail)" <blystadt@usa.redcross.org>,
"ESF-06 ARC Corliss (E-mail)" <CorlissE@usa.redcross.org>,
"ESF-06 ARC JENKINS (E-mail) (E-mail)" <jenkinsg@usa.redcross.org>,
"ESF-06 ARC Rostosky (E-mail)" <Rostoskyc@usa.redcross.org>,
"ESF-07 GSA Montgomery (E-mail)" <Kathy.Montgomery@gsa.gov>,
"ESF-08 HHS Jevec (E-mail 2)" <rjevec@osophs.dhhs.gov>,
"ESF-09 FEMA Webb (E-mail)" <Dave.Webb@fema.gov>,
"ESF-10 EPA Danielczyk (E-mail)" <sdanielczyk@comdt.uscg.mil>,
"ESF-10 EPA EOC (E-mail)" <eoc.epahq@epa.gov>,
"ESF-10 EPA Kelly (E-mail)" <kelly.sheila@epa.gov>,
"ESF-10 EPA Mjoness (E-mail)" <mjoness.mark@epa.gov>,
"ESF-10 EPA Thorne (E-mail)" <thorne.leaanne@epa.gov>,
"ESF-11 USDA/FNS Sheffey (E-mail)" <Grace.Sheffey@FNS.USDA.Gov>,
"ESF-11 USDA/FNS Warner (E-mail)" <david_warner@FNS.USDA.Gov>,
"ESF-12 DOE CAVERLY (E-mail)" <jim.caverly@hq.doe.gov>,
"ESF-12 DOE Ops (E-mail)" <doehqeoc@oem.doe.gov>,
"ESF-12 DOE Puzzilla (E-mail)" <tonyl.puzzilla@hq.doe.gov>,
"ESF-12 DOE Townsend (E-mail)" <wade.townsend@hq.doe.gov>,
"DOC (E-mail)"

<HMitche2@doc.gov>,
"DOI Land (E-mail 2)"
<IMCEAUNKNOWN-Unknown@fema.gov>,
"DOI OPS CENTER (E-mail)"
<doi_watch_center@ios.doi.gov>,
"DOL EOC (E-mail)" <EOC@dol.gov>, "DOS (E-mail)" <MockA@state.gov>,
"DOT OPS - 1 (E-mail)"
<tioc-01@rspa.dot.gov>,
"FCC (E-mail)" <comm-ctr@fcc.gov>,
"FCC Bonnie Gay (E-mail)" <bgay@fcc.gov>,
"HUD McCarthy (E-mail)"
<bruce_e._mccarthy@hud.gov>,
"NASA Lloyd (E-mail)" <JLloyd@hq.nasa.gov>,
"NASA Mullin (E-mail)" <JMullin@hq.nasa.gov>,
"OPM Jacobs (E-mail)"
<gmjacobs@opm.gov>,
treas <Ron.Bearse@do.treas.gov>, TVA
<smcrawford@tva.gov>,
tva <thalford@tva.gov>, USPS
<pmendonc@email.usps.gov>,
usps <Farvonio@email.usps.gov>, VA
<Emshg.Operations@med.va.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 Carney (E-mail)" <brian.carney@rspa.dot.gov>,
"DOT Medigovich (E-mail)" <bill.medigovich@rspa.dot.gov>,
"DOT OPS 2 (E-mail)" <tioc-02@rspa.dot.gov>,
"HOWARD. EDWARDS (E-mail)"
<HOWARD.EDWARDS@rspa.dot.gov>,
"USACE Acosta (E-mail)"
<louis.a.acosta@hq02.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: FEMA Emergency Support Team (White EST)
Date: Thu, 27 Feb 2003 16:35:01 -0500
X-Mailer: Internet Mail Service (5.5.2656.59)

All Departments and Agencies are advised that the FEMA Emergency Support Team (EST White Team) will cease operations at COB today, February 27, 2003.

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"

[redacted]

To: Cindy Lee <C.C.LEE@larc.nasa.gov>

Hi Cindy,

I would like to offer several observations regarding the theory that debris damaged Columbia's left wing during launch on January 16, 2003. I would like to be able to discuss these ideas during an appropriate Columbia accident investigation meeting here at LaRC.

1. The video footage (apparently provided by the KSC Ice & Debris Team) appears to show that the debris, assumed to be polyisocyanurate foam from the external tank (ET), may not have originated from the ET. In the first few frames of the video sequence, the debris appears to come from a location obscured by the orbiter and ricochets off the ET. The origin of debris still could be from the ET, or possibly the underside of the orbiter. After contacting the ET, the debris fragments into two visible pieces. The first, apparently smaller, debris fragment produces a small shower of particles that can be seen at the trailing edge of the left wing. The second, larger piece of debris appears to result in a much larger impact on the trailing edge of the left wing. The debris may have been made of ice or some other material(s) and could be much more massive than the calculated 1.211 kg (2.67 lb.). If the photogrammetric measurements accurately measured the debris to be 0.508 x 0.406 x 0.152 meters (20 x 16 x 6 inches), and it was made of solid ice, the mass could be approximately 28.7 kg (63.4 lb). The energy released from this impact could be almost 25 times greater than estimated. Other dense materials, such as aluminum, would make this impact even more damaging. I would like to suggest a re-examination of the debris impact video footage to determine if the fragment(s) could have originated from another location, possibly an ice buildup somewhere under the orbiter. As a reference, if the debris was 1.211 kg. and assuming a conservative relative impact velocity of 457.2 m/s (2 x 750 fps used in the JSC analysis), the kinetic energy would have equivalent to a 500 lb safe impacting at 75 mph. If the debris was 28.7 kg, that would be the equivalent of a 500 lb safe hitting the wing at 365 mph.

2. If the observation in #1 above can proven to be incorrect, and it can be definitively determined that the debris was foam insulation from the ET, there still appears to be an issue regarding its thickness. It has been estimated that the debris was 0.152 meters (6 inches) thick. Several sources that I have found indicate that the insulation is sprayed on the ET to a thickness of 1-2 inches. It is certainly possible that certain locations on the ET may have insulation that is 6 inches in depth, but how thick was the insulation at the point where it is believed to have separated? How accurately is this location known? I assumed that the volume of ET insulation can be approximated by a thin walled cylindrical body with flat, circular plates on each end. I assumed that the ET was 46.8 meters (153.8 ft) in length, 8.412 meter (27.6 ft) in diameter. I used a density of 38.63 kg/m^3 (calculated from the mass and size of the foam debris assumed in #1 above).

Using a uniform thickness of 0.152 meters (6 inches), I estimate the total mass of the insulation to be 8080 kg (17,813 lb). This is 3.7 times greater than the 2187 kg (4823 lb) that is stated on the NASA Human Space Flight Shuttle Reference web page. A 0.0254 meter (1 inch) thickness results in a total mass of 1328 kg (2928 lb), and a 0.0508 meter (2 inch) thickness results in a total mass of 2664 kg (5873 lb). These totals are consistent with a thickness of 1-2 inches. It is possible that the numbers stated on the Space Flight web page are not very accurate, but I would not expect them to be that much off. I have not heard any discussion about variations in the insulation thickness, and I would like to understand how certain we can be that the debris was entirely made of foam.

3. Even if the damage to the tiles was not obviously visible, could this type of impact carve out a significant channel in the protective tiles? This channel

would then allow extreme heating to occur down the length of the wing. How many re-entries had the tiles in the area of the suspected damage been through? Is it possible that this area could have had "older" tiles that could be more easily loosened from the wing during impact, but only separated during re-entry or later during ascent? Could the impact result in a significant increase in the surface roughness of the tiles around the impact area, and could this result in a high turbulent heating that caused tiles to be shed during re-entry? Finally, it is reasonable that the impact could have multiple effects on the orbiter, such as damage to control surfaces.

Thanks very much for your attention to these observations. I hope that they are helpful in the investigation of this terrible loss for the astronauts and their families, NASA, and our country.

Dan

--

Daniel D. Mazanek

Spacecraft and Sensors Branch, ASCAC
8 Langley Boulevard
NASA Langley Research Center Phone: (757) 864-1739
Mail Stop 328 Fax: (757) 864-1975
Hampton, VA 23681-2199 E-mail: d.d.mazanek@larc.nasa.gov

To: jlemke <jlemke@hq.nasa.gov>
From: Wilson Harkins <wharkins@hq.nasa.gov>
Subject: Fwd: CAC Code M, B, U, Q action required
Cc: jim
Bcc:
Attached: U:\users\wharkins\DATA\Columbia\Safety Reporting.doc;
U:\users\wharkins\DATA\Columbia\Space Shuttle Program Assessments.doc;

John,

I've attached what I've come up with for this CAC action. Provided for your review prior to sending to Jim. I've heard back from Eric and John Lyver and have incorporated their comments in the package. Haven't heard from Wayne or Mark Kowaleski (I understand he is out today so I don't anticipate any comments - most of the info included on shuttle processes is based on his original work anyway and I don't think I have corrupted it any) but think we should get this on its way. The second attachment is a series of abstract information I derived from copies of Independent Assessments that Steve and his team performed. I tried to structure these abstracts to look like the information that the CAC already has in place in their Shuttle, Tiles and External Tank files on the X drive. I never did get a clear response on format for this so I went with consistent wording and logical flow.

Let me know if you have any questions.

v/r

Wil

X-Sender: jlloyd@mail.hq.nasa.gov
X-Mailer: QUALCOMM Windows Eudora Version 4.3.2
Date: Mon, 10 Feb 2003 08:53:47 -0500
To: Pamela Richardson <prichard@hq.nasa.gov>
From: James Lloyd <jlloyd@hq.nasa.gov>
Subject: Fwd: CAC Code M, B, U, Q action required
Cc: wharkins@hq.nasa.gov, snewman@hq.nasa.gov, wfrazier@hq.nasa.gov,
prutledg@hq.nasa.gov, jlemke <jlemke@hq.nasa.gov>

Pam, would you and Wil Harkins coordinate with others named in this message to develop the mentioned briefing book materials to include the topics assigned Code Q as a role. We probably have this stuff; it needs to be assembled for insertion.

X-Sender: mkowales@mail.hq.nasa.gov
X-Mailer: QUALCOMM Windows Eudora Version 4.3.2
Date: Mon, 10 Feb 2003 08:25:07 -0500
To: jlloyd@mail.hq.nasa.gov, prutledg@mail.hq.nasa.gov
From: Mark Kowaleski <mkowales@hq.nasa.gov>
Subject: Fwd: CAC Code M, B, U, Q action required

X-Sender: astockin@mail.hq.nasa.gov
X-Mailer: QUALCOMM Windows Eudora Version 4.3.2
Date: Fri, 07 Feb 2003 13:54:49 -0500
To: rdavis@hq.nasa.gov, hrothman@hq.nasa.gov, rcooper@hq.nasa.gov,
dmcsween@hq.nasa.gov, dcomstoc@hq.nasa.gov, rstephen@hq.nasa.gov,
mark.kowaleski@hq.nasa.gov, gmartin@hq.nasa.gov, jbingham@hq.nasa.gov,
astockin@hq.nasa.gov, wbierbow@hq.nasa.gov, adiaz@hq.nasa.gov
From: Ashley Stockinger <astockin@hq.nasa.gov>
Subject: Fwd: CAC Code M, B, U, Q action required
Cc: HCATinfo@hq.nasa.gov

CAC Group:

As you all may know, a briefing book for the Administrator is being developed due tomorrow. Code P has divided the content of the book into the following areas:

- STS-107 crew & families
- Debris collection
- Investigation Status
- Gehman board
- NASA Budget
- Safety & Reporting Procedures
- ISS Future
- Science Impact
- Previous Reports on Shuttle, Tiles and External Tank
- Agency Program Impacts

It seems that a great deal of work is being done on this by many different people and on many different levels. So as not to duplicate our efforts I suggest the following:

Code M take action of STS-107 crew & families, debris collection, Investigation Status, Gehman board, and ISS Future
Code B take action of NASA Budget
Code Q/M take action of safety and reporting procedures
Code U take action of Science impact
Code M/Q take action of previous reports on Shuttle, Tiles and External Tank

A great deal of previously approved information about these topics can be found on the X drive under CAC in the resources file.

Any questions regarding these topics should be addressed to Code P CAC rep. Rich Cooper x1774

Thank you,
Ashley Stockinger

Ashley K. Stockinger
Office of Space Flight
NASA Headquarters
Phone: (202) 358-2397
Fax: (202) 358-2983

Jim

To: J Steven Newman <snewman@hq.nasa.gov>
From: Wilson Harkins <wharkins@hq.nasa.gov>
Subject: Re: Fwd: CAC Code M, B, U, Q action required
Cc:
Bcc:
Attached:

Thanks Steve.

Leave them on my chair if I'm not in my office.

v/r

Wil

At 09:33 AM 2/11/2003, you wrote:
Will:
There are four SSP related documents I will bring over to you soon.
Regards/Steve

At 09:11 AM 2/11/2003 -0500, you wrote:
Steve,

I'm doing some leg work for this task and I don't see any indications in the CAC data collections of any of the assessments that Code Q has performed related to ET, shuttle processing, etc. Do you have a list of all of the assessments that you've been involved in performing related to the shuttle that I could add to their info sources? If you have electronic versions let me know how I can get copies of them as well. Thanks.

v/r

Wil

X-Sender: jlloyd@mail.hq.nasa.gov
X-Mailer: QUALCOMM Windows Eudora Version 4.3.2
Date: Mon, 10 Feb 2003 08:53:47 -0500
To: Pamela Richardson <prichard@hq.nasa.gov>
From: James Lloyd <jlloyd@hq.nasa.gov>
Subject: Fwd: CAC Code M, B, U, Q action required
Cc: wharkins@hq.nasa.gov, , wfrazier@hq.nasa.gov,
prutledg@hq.nasa.gov, jlemke <jlemke@hq.nasa.gov>

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X-Mailer: QUALCOMM Windows Eudora Version 4.3.2
Date: Mon, 10 Feb 2003 08:25:07 -0500
To: jlloyd@mail.hq.nasa.gov, prutledg@mail.hq.nasa.gov
From: Mark Kowaleski <mkowales@hq.nasa.gov>
Subject: Fwd: CAC Code M, B, U, Q action required

X-Sender: astockin@mail.hq.nasa.gov
X-Mailer: QUALCOMM Windows Eudora Version 4.3.2
Date: Fri, 07 Feb 2003 13:54:49 -0500
To: rdavis@hq.nasa.gov, hrothman@hq.nasa.gov, rcooper@hq.nasa.gov,
dmcsween@hq.nasa.gov, dcomstoc@hq.nasa.gov, rstephen@hq.nasa.gov,

mark.kowaleski@hq.nasa.gov, gmartin@hq.nasa.gov, jbingham@hq.nasa.gov, astockin@hq.nasa.gov, wbierbow@hq.nasa.gov, adiaz@hq.nasa.gov
From: Ashley Stockinger <astockin@hq.nasa.gov>
Subject: Fwd: CAC Code M, B, U, Q action required
Cc: HCATinfo@hq.nasa.gov

CAC Group:

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It seems that a great deal of work is being done on this by many different people and on many different levels. So as not to duplicate our efforts I suggest the following:

Code M take action of STS-107 crew & families, debris collection, Investigation Status, Gehman board, and ISS Future
Code B take action of NASA Budget
Code Q/M take action of safety and reporting procedures
Code U take action of Science impact
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Any questions regarding these topics should be addressed to Code P CAC rep. Rich Cooper x1774

Thank you,
Ashley Stockinger

Ashley K. Stockinger
Office of Space Flight
NASA Headquarters
Phone: (202) 358-2397
Fax: (202) 358-2983

Jim

X-Authentication-Warning: spinoza.public.hq.nasa.gov: majordom set sender to owner-code-qs using -f
X-Sender: jlemke@mail.hq.nasa.gov
X-Mailer: QUALCOMM Windows Eudora Version 4.3.2
Date: Thu, 06 Feb 2003 09:11:17 -0500
To: code-qe@lists.hq.nasa.gov, code-qs@lists.hq.nasa.gov
From: jlemke <jlemke@hq.nasa.gov>
Subject: Fwd: Assessing the Odds of Catastrophe.htm
Sender: owner-code-qs@lists.hq.nasa.gov

QE/QS:

FYI RE: NASA PRA

johnl

From: "Schilder, Craig, Mr, OSD-ATL" <Craig.Schilder@osd.mil>
To: "John lemke (JLemke@hq.nasa.gov)" <JLemke@hq.nasa.gov>
Subject: Assessing the Odds of Catastrophe.htm
Date: Thu, 6 Feb 2003 08:40:35 -0500
X-Mailer: Internet Mail Service (5.5.2653.19)

February 6, 2003

Assessing the Odds of Catastrophe

By SETH SCHIESEL

POWERFUL hurricane tears through Florida.

A nuclear power plant fails.

A space shuttle breaks up on its descent.

The world is full of risks. Some, like catching a cold, can usually be shrugged off. Others, like car crashes, are more serious, but the risks can easily be understood.

Then there are risks like nature's fury, nuclear meltdowns and spacecraft calamities: events that are infrequent yet catastrophic. Their potential damage demands that the risks be minutely assessed. Their rarity makes that task especially tough.

But a rapidly evolving set of conceptual and computing tools allow mathematicians, engineers and insurance executives to assess the risk of what are euphemistically known as low-probability, high-consequence events.

The field, known in professional jargon as probabilistic risk assessment, helps companies and government agencies decide whether they are prepared to take the chances involved.

In 1995, these tools helped a NASA consultant estimate the risk of a catastrophic space shuttle failure at 1 in 145, or about 0.7 percent, for each mission. NASA accepted that risk. Similar methods are used to estimate the health risks at toxic-waste sites, to secure nuclear laboratories, weapon stockpiles and power plants, and to determine the safety and reliability of planes and cars. They help determine home insurance rates for tens of millions of people in the United States, Europe and Japan. And now some of the techniques are being used to analyze the chances of terrorist attack.

The concepts were developed four decades ago, but recent advances in computing power have increased both the use of such analyses and the confidence in them.

"A couple of years ago the computers couldn't run these sorts of programs," said Detlef Steiner, a mathematician who is chief executive of the Clarendon Insurance Group of New York, the

biggest subsidiary of the insurance giant Hanover Re. "Now they can do it, no problem."

And yet, of course, disasters still happen. What the risk analyses can do in the case of a space project, for example, is not only estimate the overall chances of a failure, but also compare the many ways it might unfold, helping engineers direct their resources, and preventive efforts, accordingly.

The idea behind probabilistic risk assessment is that mathematics can help determine the chances of a particular outcome (a power system failure, or a hurricane that destroys thousands of homes) based on what is known or estimated about the smaller variables that lead to those outcomes.

For example, companies serving the insurance industry develop models of hurricane behavior based on historical data that might include a dozen variables. Those variables would include the number of hurricanes that might strike, their initial location, their path, their size and their intensity, according to Karen M. Clark, president and chief executive of the AIR Worldwide Corporation, a developer of risk models for the insurance industry.

The analysts then try to use historical data to estimate the relative frequency of those variables.

These models might include 5,000 or 10,000 different potential hurricane patterns that have been weighted for relative frequency based on the historical record. For instance, the experts think that a storm as ferocious as Hurricane Andrew, which devastated parts of south Florida in 1992, will occur on average every 30 or 40 years.

The 5,000 or 10,000 storm patterns (some of which include no hurricanes and a few of which include Florida-destroying cataclysms) are then applied in random order to models of the properties insured by one particular company. Using a random order is called a Monte Carlo analysis. The results of those thousands of tests, known as iterations, are aggregated to form an overall picture of what is likely to happen.

To illustrate this, Mr. Steiner estimated that the most likely hurricane outcome for any given year would cost his company about $50 million.

"Every 100 years we might have $600 million," he estimated. "A thousand-year event might cost us a billion. But remember, a thousand-year event hasn't happened. A thousand-year event tells you Florida is gone."

The insurance sector did not show much interest in probabilistic modeling until Hurricane Andrew wiped out years of profits. Even a few years ago, however, the paucity of commonly available computing power made the models much less useful.

"Five years ago, people were running these models on county-level exposure information," said Chris McKeown, president and chief executive of Ace Tempest Reinsurance Ltd. of Bermuda, a major property reinsurance company. (Reinsurance companies buy portfolios of insurance policies from insurers who deal with the public.) "Now you can run these models on a street-by-street level and do it in a matter of hours."

Jim Goodnight, chairman and chief executive of SAS, the big maker of statistical software, said that with faster processors, more advanced software and a huge availability of memory - whether on big mainframe computers or on lashed-together PC systems - "the ability to do the incredibly difficult modeling is becoming more reachable every day."

No matter how advanced the equipment, however, the difference between modeling Florida hurricanes for insurance purposes and modeling, say, a spacecraft is roughly akin to the difference between simple algebra and building a corporate spreadsheet- same idea, much greater magnitude.

While a hurricane model might include a dozen variables, an advanced model for probabilistic risk assessment in an industrial situation - mounting a space mission, operating a nuclear plant - might include thousands or tens of thousands or sometimes even hundreds of thousands of pieces, each representing a separate component that could malfunction or fail. Most important, the model must be set up to describe the operational interaction among those components

precisely.

It is a task somewhat akin to trying to simulate each individual wind eddy within a hurricane, a herculean task if it is even possible.

The sheer number of variables is not the only hurdle. Hurricane modelists can extrapolate from a huge historical database. An engineer designing parts for a new spacecraft, nuclear installation or submarine may have to develop a computerized model to test the physical and electromagnetic properties of each component before the resulting data can be fed into a probabilistic analysis.

In that sense, the insurance-related modelists focus on effects while the industrial modelists are trying to understand root causes of potential problems.

"We pretty much understand that if a tornado rips through a trailer park that a lot of the trailers will be gone," said Annette MacIntyre, acting division leader for the electronics engineering technology division at Lawrence Livermore National Laboratory in Livermore, Calif. Ms. MacIntyre said that she had worked with probabilistic models for two decades and had been engaged in programs involving nuclear waste storage and energy. "The insurance industry is mostly focused on what will happen if an event does happen. I am trying to prevent. They are trying to mitigate."

The general consensus in the risk-management industry seems to be that NASA was not much interested in probabilistic analysis until the 1986 Challenger disaster, much as the insurance industry did not pay attention until Hurricane Andrew.

"If it's a Department of Defense project, you have to meet certain standards, and the risk-analysis stuff was actually incorporated as a design tool," said Robert K. Weatherwax, who conducted a probabilistic study for the Air Force in the 1980's on the potential public health hazards of using plutonium in spacecraft. "NASA never did that."

Mr. Weatherwax, who is now president of Sierra Energy and Risk Assessment, which mostly serves the energy industry, said that NASA's traditional engineering philosophy had been to focus on backup systems as a sort of catch-all safety and reliability philosophy.

"The idea was that this would substitute for quantitative analysis," Mr. Weatherwax said. "In the shuttle, though, they realized they it would weigh too much and cost too much so they couldn't have the level of redundancy they were accustomed to. And numbers were bad news to NASA. They didn't want anyone to talk about the probabilities."

NASA declined to comment on its risk analysis procedures for this article, but since the Challenger disaster, it has clearly come to embrace probabilistic methods. It has put on at least two workshops on the subject in recent years, and it contracted with the Science Applications International Corporation in the mid-1990's to conduct the probabilistic analysis of shuttle risks that provided the 1-in-145 calculation.

The study identified seven broad categories of risks that could lead to a shuttle catastrophe. It estimated that if a catastrophe occurred, the most likely culprit, with a 37.8 percent chance, would be the shuttle's main engines.

It is unclear whether the report told NASA something the agency already knew or whether it opened the agency's eyes to a lurking problem. It is clear, however, that by 1997 the biggest shuttle upgrade program involved improving pumps for the main engines. Moreover, a 2000 report from the General Accounting Office said that of the shuttle upgrades that NASA planed to incorporate by 2005, the most expensive related to upgrading the main engines.

A category that is now a focus of the Columbia investigation, the craft's protective tiles, was considered a less likely cause - with a 14.8 percent likelihood - of a catastrophic failure.

Probabilistic models, of course, are only as useful as the assumptions fed into them. Moreover, they are best used when a system or piece of equipment is being designed, not after it is in the field or in space.

"The most applicability is in the manufacturing of satellites," said James B. Frownfelter, chief operating officer of PanAmSat, the No. 1 commercial satellite-services company. "It is extremely important to employ these tools early in the process. Doing this at the beginning allows you to determine where to focus your testing and your overall cost profile."

Mr. Frownfelter said that PanAmSat's contractors use probabilistic models to help assure that their craft can meet the requirement of an 80 percent chance of flawless operation for 15 years.

For all of the difficulties of modeling complex technical systems, however, the most daunting challenge may be modeling minds. That is because the next frontier in assessing the risks of "low-probability, high-consequence events" is terrorism.

In describing the challenge of modeling terrorism, Hemant H. Shah, chief executive and president of RMS, a risk-modeling firm, echoed Einstein's adage: "Subtle is the Lord, but malicious he is not."

"Hurricanes do not make an effort to strike your weak points," Mr. Shah said. "In the case of terrorism you're dealing with a question of intent. You're modeling an adversary in the context of conflict."

Mr. Shah's firm and others are now using advanced game theory techniques, which emulate human decision-making, to try to build terrorism models.

Ms. MacIntyre, the risk-assessment expert from Lawrence Livermore, seemed to have one piece of advice. "You're trying to focus on those things that are important," she said, speaking generally. "You can't model all of reality. What would be the point?"

X-Sender: astockin@mail.hq.nasa.gov
X-Mailer: QUALCOMM Windows Eudora Version 4.3.2
Date: Mon, 10 Feb 2003 13:20:13 -0500
To: Wilson Harkins <wharkins@hq.nasa.gov>
From: Ashley Stockinger <astockin@hq.nasa.gov>
Subject: Re: Fwd: CAC Code M, B, U, Q action required

I have been working at another station and I am late in getting back to you on this. Has the answer already been provided to you, or do you still need me to get some guidance?

Sorry for the delay,
Ashley

At 09:52 AM 2/10/2003 -0500, you wrote:
Ashley,

I've been tasked in Code Q to help put together our portion of the book, do you have any guidance on format for the briefing book?

v/r

Wil

X-Sender: astockin@mail.hq.nasa.gov
X-Mailer: QUALCOMM Windows Eudora Version 4.3.2
Date: Fri, 07 Feb 2003 13:54:49 -0500
To: rdavis@hq.nasa.gov, hrothman@hq.nasa.gov, rcooper@hq.nasa.gov, dmcsween@hq.nasa.gov, dcomstoc@hq.nasa.gov, rstephen@hq.nasa.gov, mark.kowaleski@hq.nasa.gov, gmartin@hq.nasa.gov, jbingham@hq.nasa.gov, astockin@hq.nasa.gov, wbierbow@hq.nasa.gov, adiaz@hq.nasa.gov
From: Ashley Stockinger <astockin@hq.nasa.gov>
Subject: Fwd: CAC Code M, B, U, Q action required
Cc: HCATinfo@hq.nasa.gov

CAC Group:

As you all may know, a briefing book for the Administrator is being developed due tomorrow. Code P has divided the content of the book into the following areas:

- STS-107 crew & families
- Debris collection
- Investigation Status
- Gehman board
- NASA Budget
- Safety & Reporting Procedures
- ISS Future
- Science Impact
- Previous Reports on Shuttle, Tiles and External Tank
- Agency Program Impacts

It seems that a great deal of work is being done on this by many different people and on many different levels. So as not to duplicate our efforts I suggest the following:

Code M take action of STS-107 crew & families, debris collection, Investigation Status, Gehman board, and ISS Future
Code B take action of NASA Budget
Code Q/M take action of safety and reporting procedures
Code U take action of Science impact
Code M/Q take action of previous reports on Shuttle, Tiles and External Tank

A great deal of previously approved information about these topics can be found on the X

drive under CAC in the resources file.

Any questions regarding these topics should be addressed to Code P CAC rep. Rich Cooper x1774

Thank you,
Ashley Stockinger

Ashley K. Stockinger
Office of Space Flight
NASA Headquarters
Phone: (202) 358-2397
Fax: (202) 358-2983

Jim

Ashley K. Stockinger
Office of Space Flight
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X-Authentication-Warning: spinoza.public.hq.nasa.gov: majordom set sender to owner-code-q using -f
X-Sender: mstamate@mail.hq.nasa.gov
X-Mailer: QUALCOMM Windows Eudora Version 4.3.2
Date: Thu, 13 Feb 2003 15:26:49 -0500
To: code-q@lists.hq.nasa.gov
From: Michael Stamatelatos <mstamate@hq.nasa.gov>
Subject: Fwd: Excite News
Sender: owner-code-q@lists.hq.nasa.gov

For your information.

Date: Thu, 13 Feb 2003 14:36:17 -0500
From: Joseph R Fragola <fragola@prodigy.net>
Reply-To: fragola@prodigy.net
Organization: Science Applications
X-Mailer: Mozilla 4.79 (Macintosh; U; PPC)
X-Accept-Language: en
To: Doyle McDonald <fdole@swbell.net>,
"Railsback, Jan" <jan.railsback1@jsc.nasa.gov>,
Michael Stamatelatos <mstamate@hq.nasa.gov>
Subject: Excite News

FYI
http://apnews.excite.com/article/20030213/D7P5UILG2.html

Landing Gear Suspect in Shuttle Disaster
Email this Story

Feb 13, 1:52 PM (ET)

By TED BRIDIS

WASHINGTON (AP) - NASA confirmed Thursday one sensor aboard Columbia indicated its left landing gear was improperly lowered moments before it disintegrated over Texas as it raced through earth's atmosphere at more than 12,000 miles per hour. But it said other sensors conflicted with those readings.

The disclosure focused renewed attention on possible catastrophic failures inside Columbia's wheel compartment inside its left wing that may have attributed to the mysterious breakup.

Safety engineers believe an unusually large chunk of flyaway foam from Columbia's external tank struck the shuttle on liftoff and may have damaged delicate insulating tiles near that area, but they concluded Columbia could return safely.

NASA spokesman William Jeffs at Johnson Space Center confirmed that one sensor indicated Columbia's gear was lowered as it raced over Texas at 209,000 feet and flying at 18 times the speed of sound - far too high and too fast for that to happen. But Jeffs cautioned that two other sensors at the time indicated the gear was still properly raised.

"We're not certain if the readings showed the landing gear deployed or were the result of a faulty sensor that sent bad data," Jeffs said. "One indicated (the wheel) was down and locked, and that was shortly before radio contact with the orbiter was lost."

NASA dislosed Wednesday that a safety engineer wrote two days before Columbia's mysterious breakup about risks to the shuttle from "catastrophic" failures caused by tires possibly bursting inside the spacecraft's wheel compartment from extreme heat.

Robert H. Daugherty, responding to an inquiry from Johnson Space Center, cautioned in an e-mail to NASA colleagues that damage to delicate insulating tiles near Columbia's landing gear door could cause one or more tires inside to burst, perhaps ending with catastrophic failures that would place the seven astronauts "in a world of hurt."

Such an explosion inside Columbia's belly, Daugherty predicted, could blow out the gear door and expose the shuttle's unprotected innards to searing temperatures as it raced through earth's atmosphere.

Ret. Admiral Harold Gehman, who heads the panel investigating the Columbia accident, on Thursday called Daugherty's e-mail "one of the many, many interesting leads that we have."

On the same day NASA disclosed the contents of Daugherty's e-mail, searchers near Hemphill, Texas, about 140 miles northeast of Houston, recovered what they believed to be one of Columbia's tires.

The tire was blackened and sustained a massive split across its tread, but it was impossible from photographs to know whether the tire was damaged aboard Columbia or when it struck the ground.

NASA officials in Washington and Houston on Thursday said they could not confirm the tire was the shuttle's, but one person familiar with tires on the orbiter looked at a photograph of the tire found in Texas and said it appeared to be from a shuttle.

In his e-mail, which included remarkably strident language, Daugherty wrote that even if astronauts survived the heat, the blast could damage critical systems inside the wheel compartment, prevent the landing gear on one side from lowering, necessitate a risky belly landing or force the crew to bail out.

Bailing out would be "not a good day," he wrote. But attempting to fly the shuttle with only one side's landing gear lowered would be worse: "You're finished."

Flight Director Leroy Cain said Wednesday that investigators were confident the gear door did not fall off in flight because such a failure would have been indicated on sensor readings.

Other NASA officials have cited mysterious sensor readings in the wheel well moments before Columbia's breakup but have said they were confident the tire didn't burst inside the shuttle.

Daugherty acknowledged these were "absolute worst-case scenarios," adding, "I don't really believe things are as bad as I'm getting ready to make them out." But he defended raising the issues in e-mail to avoid a "gut-wrenching decision" days later during Columbia's descent.

Daugherty on Wednesday referred questions about his concerns to a NASA spokesman. Agency officials indicated they did not want reporters to speak with Daugherty because accident investigators had not yet questioned him. NASA disclosed the contents of his e-mail Wednesday.

The e-mail from Daugherty, an engineer at NASA's Langley research facility in Hampton, Va., was prompted by a telephone call Jan. 27 from experts at the Johnson Space Center in Houston who asked what might happen if Columbia's tires were not inflated when it attempted to land.

The inquiry from Johnson has attracted interest because it came four days after engineers at The Boeing Co. (BA), a contractor, assured NASA that Columbia could return safely despite damage to left wing tiles that might have occurred on liftoff.

Senior NASA officials said Daugherty's concerns were part of a "what-if" analysis by a small group of engineers who already had been assured that Columbia would land safely. They acknowledged that concerns about threats to the shuttle's tires were not passed along to NASA flight directors.

Milt Heflin, chief of the flight director's office, said Daugherty and others involved in the tire questions "were happy with the analysis and the work that was done" by Boeing. "They were continuing to do more what-if'ing."

An e-mail back to Daugherty the next day from a Johnson Space Center engineer, David F. Lechner of the United Space Alliance LLC, another NASA contractor, thanked Daugherty for his "candid remarks." He said they "generated extremely valuable discussion in our group."

"We hope the debris impact analysis is correct and all this discussion is mute," Lechner wrote.

Another Langley employee, Mark J. Shuart, responded by e-mail later that day, "Looks like they believe all this has been addressed." His message was time-stamped about 20 hours before the shuttle disintegrated.

Senior NASA officials have repeatedly expressed confidence in Boeing's conclusions, which predicted "safe return indicated" even if foam insulation that fell from Columbia's external fuel tank had caused "significant tile damage." That study assumed foam debris struck part of Columbia's left wing, including its toughened leading edge and the thermal tiles covering the landing gear.

Testifying at a joint congressional hearing Wednesday, NASA Administrator Sean O'Keefe told lawmakers that during Columbia's 16-day mission, "there were no abnormalities that would suggest a problem. If there was any indication, they would have showed up."

Among the earliest warning signs aboard Columbia in the minutes before its demise was an unusual heat buildup of about 30 degrees inside the left wheel well. Investigators have said they are confident the tire inside didn't deflate, but they have been unable to explain the readings.

Articles From AP

****
Dr. Michael Stamatelatos
Manager, Agency Risk Assessment Program
NASA Headquarters - Mail Code QE
Office of Safety and Mission Assurance
300 E Street, SW
Washington, DC 20024
Phone: 202/358-1668 Fax: 202/358-2778
E-mail: Michael.G.Stamatelatos@nasa.gov
(Please note change in e-mail address)
****

"Mission success starts with safety"

X-Sender: twhitmey@mail.hq.nasa.gov
X-Mailer: QUALCOMM Windows Eudora Version 4.3.2
Date: Mon, 10 Feb 2003 10:21:04 -0500
To: wharkins@hq.nasa.gov
From: Thomas Whitmeyer <Tom.Whitmeyer@hq.nasa.gov>
Subject: Fwd: Re: ARTICLE FOR YOUR REVIEW

FYI

X-Sender: shollida@mail.hq.nasa.gov
X-Mailer: QUALCOMM Windows Eudora Version 4.3.2
Date: Mon, 10 Feb 2003 10:04:54 -0500
To: g.l.norbraten1@jsc.nasa.gov, larry.dyer1@jsc.nasa.gov,
dmclaugh@smtp3.wstf.nasa.gov, mkirsch@wstf.nasa.gov,
David.G.Cleveland.1@gsfc.nasa.gov, harold.e.mitchell.1@gsfc.nasa.gov,
Axel.Roth@msfc.nasa.gov, Don.Miller@msfc.nasa.gov,
Olga.D.Gonzalez-Sanabria@grc.nasa.gov, Karen.M.Meinert@lerc.nasa.gov,
rserrano@mail.arc.nasa.gov, mwashington@mail.arc.nasa.gov,
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Michael.Bell-2@ksc.nasa.gov, Jerry.W.Suitor@jpl.nasa.gov,
Peter.Barry@jpl.nasa.gov, Robert.W.Kerr@jpl.nasa.gov,
d.b.price@larc.nasa.gov, K.C.Suddreth@larc.nasa.gov,
Michael.Wethington@ssc.nasa.gov, John.G.Griggs@ivv.nasa.gov,
gregory.blaney@ivv.nasa.gov, jwerner@mail.hq.nasa.gov,
cwashing@mail.hq.nasa.gov, twhitmey@mail.hq.nasa.gov
From: Scott M Holliday <shollida@hq.nasa.gov>
Subject: Fwd: Re: ARTICLE FOR YOUR REVIEW

I should have forwarded this response to you so you know what I said...and in case he doesn't listen...

X-Sender: shollida@mail.hq.nasa.gov
X-Mailer: QUALCOMM Windows Eudora Version 4.3.2
Date: Mon, 10 Feb 2003 10:00:03 -0500
To: "Alan Dessoff" <dessoff@erols.com>
From: Scott M Holliday <shollida@hq.nasa.gov>
Subject: Re: ARTICLE FOR YOUR REVIEW

Alan:

I fully understand there is a certain amount of journalistic sensationalism associated with drafting an article, but in this case the facts have been distorted.

I never came close to saying "Shuttle Disaster Causes NASA to Delay ISO 9001 Policy Change" as the title of your draft article states below. As you can see from my answers to your questions on February 3 below, I said that the new policy "is still being worked." When I responded to your questions on February 3, 2 days after the disaster (and the first non-weekend day after the disaster) I only stated that NASA's priorities were (naturally) different than they were the Friday before the disaster. The only implication was that on February 3, I would not have been surprised if we did not meet our schedule for approving the new policy due to the resources being applied to the investigation. However, since then, the NASA Administrator has made it clear that while we need to understand completing the investigation is crucial, we also need to keep doing our jobs. As a result, I fully expect NASA to publish a new policy in March as originally scheduled. Additionally, there is no relationship between the new policy and the disaster. So to write that our policy is going to be delayed, and the shuttle disaster is the cause is simply untrue on both fronts.

One other point: At this point, the new NASA management systems policy will say that ISO 9001 registration is not required. It will also say that ISO 9001 may be used to satisfy the new

policy, but additional approaches may also be acceptable, where approved by the Deputy Administrator. In other words, the issue of whether to make ISO 9001 certification required is not being debated. It's not going to be required. The only issue(s) are what minor modifications to the draft policy are going to be made before it is published. Hope this clarifies NASA's position.

Scott

Your questions, and answers to your questions (in red) below:

You will recall that we talked last summer and I subsequently wrote an article for the September 2002 issue of Quality Systems Update newsletter about NASA considering a new ISO 9001 registration policy.

Question: What happened to that? What is its status now?
The Agencywide ISO 9001 Registration policy is still being worked. Until we resolve some issues, I'm not prepared to comment further at this time. Before saturday's disaster, I would have told you that I would expect any new policy to be approved by the NASA Administrator in the next month or so. However, in light of saturday's disaster, I don't feel very confident in any timeframe for expecting an approved policy...for no other reason than NASA's priorities are different than they were a few days ago. Suggest you contact me in approximately 60 days and I may be able to give you a better idea.

The Columbia tragedy raises a related question: Is there any concern at NASA about its management systems in light of this tragedy? Might it impact the consideration of the ISO 9001 registration policy change?
To my knowledge, there isn't any concern about NASA's management systems at this time. I believe the investigation team will need to "peel the onion apart" a bit before they could possibly conclude that NASA's management systems policy either had a role to play in the disaster, or could have a role to play in preventing such a future disaster. In all fairness, it's only been a couple of days, and the NASA investigation team is going to need some time to determine any root and/or contributing causes. As I mentioned above, suggest you contact me in approximately 60 days, and I may have better/more information for you...

I appreciate your forbearance, and will be happy to provide you more information as it becomes available.

Shuttle Disaster Causes NASA to Delay ISO 9001 Policy Change

The space shuttle Columbia disaster has caused the National Aeronautics and Space Administration (NASA) to delay approval of a policy change to give its headquarters and various centers the flexibility to decide for themselves whether they want to maintain their ISO 9001 registrations.
A timeframe for approval of a revised ISO 9001 registration policy is uncertain "for no other reason than NASA's priorities are different than they were" because of the Columbia tragedy, says Scott Holliday, director of NASA's ISO 9001 program office.
Commenting two days after the February 1 tragedy, Holliday said that to his knowledge, there was no concern at that time about NASA's management systems or their role, if any, in the Columbia's breakup. "I believe the investigation team will need to 'peel the onion apart' a bit before they could possibly conclude that NASA's management systems policy either had a role to play in the disaster or could have a role to play in preventing such a future disaster," Holliday stated. He added: "In all fairness, it's only been a couple of days, and the NASA investigation team is going to need some time to determine any root and/or contributing causes."
Current NASA policy requires the agency's headquarters and centers, including the Kennedy Space Center in Florida and the Johnson Space Center in Texas, to be registered to ISO 9001. NASA was the world's first federal or state agency with multiple sites to have all its sites registered to ISO 9001 and NASA headquarters was among the first corporate headquarters worldwide to achieve registration to the standard.

As *QSU* reported in September 2002, the concept NASA is considering now is to "recognize that we need disciplinary management systems but may want to provide some enhanced flexibility in terms of what the actual requirements are," according to Holliday. Even if the policy change is adopted, "I fully expect at least half our centers to maintain their registrations," he said last September.

The suggested policy change came from a Freedom to Manage review of NASA management systems in general, Holliday says. Freedom to manage is part of the President's Management Agenda that calls for removing barriers to more efficient management and higher performance throughout government.

NASA Administrator Sean O'Keefe, in an internal television broadcast to NASA employees and an April 24, 2002 letter to senior managers, said "being creative and finding new ways to set aside bureaucratic obstacles" is the heart of the Freedom to Manage effort. He asked for suggestions for "removing such barriers" and received more than 330 of them on a broad range of subjects.

NASA formed a Freedom to Manage Task Force to sort through the suggestions and distill them into legislative proposals. "We're looking at Freedom to Manage not only in the legislative context but also in terms of what we do internally," Holliday says. "The task force is looking (at) our management systems in terms of reducing requirements and providing NASA headquarters and centers with greater flexibility."

Former Administrator Daniel S. Goldin challenged NASA in November 1996 to register all its facilities to ISO 9001 by September 1999 and the agency met the challenge. "We are leaders in the world of science and technology. We must also be leaders in the world of quality," Goldin pronounced in launching the effort. Thirteen NASA sites were registered.

John Lyver, then manager of NASA's ISO 9000 integration, said at the time that registration to the standard "changed the attitude" in the agency to a focus on "process." Some centers reworked their entire organization and management structures based on ISO 9000, he said.

At 11:20 AM 2/9/2003 -0500, you wrote:

Scott...

As before, attached is a draft of an article I talked to you about last week for Quality Systems Update, the ISO 9000 newsletter.

Only the first three paragraphs are new. The rest is from the article we published last September.

Please review this and let me know ASAP if there are any factual corrections to be made.

Many thanks.

Alan

Phone: 301-986-5179

~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~

Tom Whitmeyer
Manager, Agency Quality Program
NASA Headquarters
Office of Safety and Mission Assurance
Code QS
Ph: 202 358-2228 Fax: 202 358-3104

~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~

To: Pete Rutledge <prutledg@hq.nasa.gov>
From: John P Castellano <jcastell@hq.nasa.gov>
Subject: Re: Supporting Bryan on the Columbia Accident Investigation Board (CAIB)
Cc: steverooo
Bcc:
Attached:

Pete, a possible area of review and assessment could be in the performance of the two ET configurations (LWT and SLWT) . Specifically looking at post flight orbiter tile damage vs the ET used for the flight. Further an evaluation of ambient atmospheric conditions (temp, dew point) at time of launch plotted against tile damage..and ET might also be informative. This sort of assessment was extremely useful in the Challenger investigation which showed a definitive relationship of O ring blow by and temperature...with greater blow by as the temperature was lower...

At 07:49 PM 2/2/2003 -0500, you wrote:
Code Q staff members,

As you may know Bryan is the ex-officio member of the Columbia Accident Investigation Board. He left for Barksdale AFB this afternoon around noon time. That is where he will meet up with the other CAIB members.

One of our main jobs in the immediate future will be to support him. We can support him in at least three ways: 1. We can respond to his requests. 2. We can collect, on our own initiative, data that could be of use to him (but we need to proceed most carefully on this one). 3. We can suggest questions or avenues of investigation that he might be able to inject into the work of the board.

Attached is a rough list we prepared today of investigative areas--for the most part these are areas in which the SMA community has some special expertise. For each area we have tentatively named an OSMA lead (and in some cases more than one person to work together). If you can think of other areas that we have not captured, and should, let me know. If we've associated you with the wrong area(s) or failed to associate you with the right area(s), let me know. We don't want to disrupt the investigation--we want to be prudent; we want to help Bryan. Think about whether and how you might be able to be helpful in these areas; then, before you take any action, write down your plan in a clear, concise manner, and send it to me--state what you might be able to do and how you would propose to do it. Then wait for a go-ahead from Jim or me. Keep in mind that we have asked the SMA directors at JSC, MSFC, KSC, LaRC, ARC, and SSC to work with us as needed, so this can be part of your plan, if appropriate.

We have also asked all 10 SMA directors to think of questions or issues that Bryan might pursue with the CAIB. I will be collecting these inputs. Your questions and issues are solicited, as well. Put your investigator hat on, think about this, do your own personal fault trees and hazard analyses, send me your ideas. I'll collect them up, as well, to send to Bryan.

Let's do a great job for Bryan on this important matter.

Thanks,

Pete

Peter J. Rutledge, Ph.D.
Director, Enterprise Safety and Mission Assurance Division
Acting Director, Review and Assessment Division
Office of Safety and Mission Assurance
NASA Headquarters, Code QE, Washington, DC 20546

ph: 202-358-0579
FAX:202-358-2778
e-mail: pete.rutledge@hq.nasa.gov

Mission Success Starts with Safety!

To: Pete Rutledge <prutledg@hq.nasa.gov>
From: John P Castellano <jcastell@hq.nasa.gov>
Subject: Support to Bryan
Cc: snewman@hq.nasa.gov
Bcc:
Attached:

In status briefings Ron D. mentioned that during re-entry the Orbiter Flight Control System saw excursions that exceeded the family of previous experience but within the system margins utilizing elevon and RCS attitude control..The cause of these excursions was attributed to drag on the left wing..possibly due to missing tiles. Additionally it has been reported that the temperature rises measured at various locations (wheel well , left fuselage etc.) were in the neighborhood of 40-50 F not high enough to represent a structural problem.. Previous flights have come home with some very significant tile damage (dings) as well as some missing without causing a problem. Undoubtedly this previous experience is a factor in the analysis and belief that this mission (and potential damage) did not represent a threat to flight safety..

If we postulate that elevated temperatures (up to the point of loss of vehicle) be ruled out as the factor (thus precluding a structural failure) and that the drag on the left side was due entirely to the progressive loss of tiles (unzippering) then at some point in this unzippering the Flight control system authority to safely maintain attitude and control will be become insufficient...

Perhaps some of the Flight Control folks are already looking into running simulations to determine tile loss vs margins since it seems intuitive that at some point in tile loss that the attitude control system will be overwhelmed..and unable to compensate.

From: "Guy Cramer" <gcramer@uniteddynamics.com>
To: <bill.loewy@hq.nasa.gov>
Subject: Special Report: Shuttle Columbia Disaster: Wrong Place, Wrong Time!
Date: Mon, 10 Feb 2003 12:54:34 -0800
X-Mailer: Microsoft Outlook Express 6.00.2800.1106

While this may not be the appropriate contact, I have the following information regarding a rare Solar shockwave which stuck or atmosphere just as Columbia began to experiance problems both ACE and SOHO satallites detected the shockwave.

Last year NASA JPL (Jet Propulsion Laboratory) contacted me to provide background on air ions for their research. They informed me that my research data saved them years of study. While it was an honour to be asked it also indicated that NASA did not have someone studying this area. The recent Shuttle Columbia disaster has challenged NASA to find out what went wrong. Given that the accident happened in the ionosphere, one of the least understood areas of our atmosphere, I began to look for ion related problems. A rare solar wind shockwave detected by two satellites hit the Earth at the same time the shuttle accident happened. A series of events with the shuttle landing relating to this shockwave appear to shed some light on the accident. This paper has been sent to my contact at NASA JPL. Guy Cramer

Shuttle Columbia Disaster: Wrong Place, Wrong Time! Summary Version

by Guy Cramer

Shuttle's demise linked to an unexpected interaction of Astrophysics, Geophysics, Electrophysics and just bad timing.

Due to the technical nature of this paper I have provided a shortened summary here in easier to read format. **If you want to view the entire paper with the additional, information pictures and diagrams go here Full Paper**

Summary:

Feb 1, 2003 23:10 UT = 8:10 AM EST: The Space Shuttle Columbia is a go from NASA for Deorbit landing procedures. Within minutes ACE and SOHO satellites, located upstream of the Solar wind detect a rare abrupt increase in solar wind speed known as a shockwave that will reach Earth 43 minutes later.

Columbia goes through expected communications blackout as it travels through the ionosphere.
The Double Delta Wing of the Shuttle with increased drag and resistance might have been prone to problems with increased ionization where the vortexes occur (the point where the wing angles as seen in wind tunnel testing of another Double-Delta wing aircraft in the picture on the right).

At the peak the Shuttle experiences the highest heating and ionization from friction of the atmosphere, it automatically banks hard right to dissipate speed. The Shuttle Wing is a Double Delta wing, specifically used as the forward placed delta wing creates vortices that flow smoothly over the main delta wing which creates greater lift and reduces drag. In this steep bank, the left wing is now taking the brunt of the heat and ionization while the vortices from the double-delta of the left wing would be much greater than those on the right wing, everything to this point is within normal expected parameters.

In 1973 the navy satellite Triad detected current sheets running up and down the polar regions of the sunlight morning and evening boundaries, these sheets carries a million amperes or more. Solar shockwaves can push Auroral areas towards the equator. Columbia, due to its altitude enters sunlight over California. The Shockwave arrives, this increase in the solar wind compresses the magnetosphere, very little is understood about the interaction between shockwave events and high altitude effects.

Just as Columbia is over San Francisco within the ionosphere, entering sunlight, crossing a potential current sheet, while in a high right bank, with greater than normal vortexes created by the left double delta wing, as the solar wind shockwave hits the magnetosphere, an astronomer takes a picture of Columbia overhead and captures a luminous purple corkscrew object hitting the Shuttle.

The apparent lightning strike was probably following the highest charged area of the shuttle which may have been the vortexes coming from the left double delta where the two angles of the delta meet, due to the right banking of the Shuttle at the time. Whether ionization, heat or even sound from this apparent lightning discharge, the problem was small to begin with such as one of the airtight seals opening, sensors within the wheel well indicate only slight temperature rises at first. The Soviet shuttle Buran, made after but based of the Space Shuttle design, showed that the heat shield was prone to acoustic (sound) testing causing the Soviets to redesign their heat shield.

Once the internal structure was compromised, given the altitude and speed, little if anything could have been done to stop the ensuing damage from spreading to the point the thrust rockets could not compensate for drag and aerodynamics problems.

- The Shuttle is at peak heat and ionization from reentry.
- The Shuttle is banking hard right to decelerate, three minutes before the sensors indicate any problems, the left wing is the hottest and highest charged spot on the shuttle.
- The Double Delta design of the wing means that the left wing is creating a larger vortex than the right wing during the bank.
- The Shuttle Crosses into daylight (known at higher latitudes to have a current sheet in the ionosphere).
- An astronomer in San Francisco captures a luminescent purple corkscrew (similar to a vortex) striking the Shuttle at this time.
- Electrophysicists in the U.S. studying high altitude lightning feel there may be a connection but no thunder clouds are prevalent in California at the time to explain it.
- The missing piece of the puzzle: A rare Solar Shockwave strikes the atmosphere at the same time the Shuttle is deorbiting.
- Excess energy from the solar wind and/or shockwave somehow charges the ionosphere and causes the current sheet to drop to lower latitudes.
- The Shuttle being the most highly charged object in the atmosphere, trailing an ion (highly charged) wake becomes a lightning rod.
- Even with the Shuttle speed of Mach 18+ lightning within the ionosphere can travel 20 million miles an hour.
- The ionosphere becomes a conductor between the shuttles charge and the extra ionosphere charge from the solar wind shockwave.
- Heat, ionization and/or the sound (thunder) from the strike begins to affect areas behind the leading edge of the left double delta wing of the Shuttle.
- Within 10 minutes the Shuttle breaks up.

Had the Shuttle begun the deorbited a few minutes earlier or a few minutes later, had it not crossed into daylight, had the rare shockwave not happened at just that time...The shuttle happened to be in the wrong place at the wrong time.

Conclusion:

Shockwaves detected by ACE and SOHO must be factored into future spacecraft landings and launching, any sign of a shockwave and the landing must be delayed. Landings and launchings should also take place when the landing path is not in sunlight so the spacecraft doesn't cross either the morning or evening sunlight transitions to avoid potential charged sheets in the ionosphere. The Russian results on acoustic testing of the Barun project should be reviewed for potential changes to the heat shield and structure modifications.

If you want to view the entire paper with the additional information, pictures and diagrams go here Full Paper

Go to the Home Page www.SuperForce.com

From: "DeWitte, Connie K" <DeWitte.Connie@hq.navy.mil>
To: "'jlemke@hq.nasa.gov'" <jlemke@hq.nasa.gov>
Subject: FW: Condolences
Date: Mon, 3 Feb 2003 17:52:03 -0500
X-Mailer: Internet Mail Service (5.5.2653.19)

> -----Original Message-----
> From: DeWitte, Connie K
> Sent: Monday, February 03, 2003 5:43 PM
> To: 'jlloyd@hq.nasa.gov'; 'jlemcke@hq.nasa.gov'
> Subject: Condolences
>
> Jim/ John:
>
> We are saddened over the tragedy and thinking about our colleagues at
> NASA. It was our impression that all NASA comes together to celebrate
> successes, and surely all NASA is mourning this sad event. You probably
> know that RDML Steve Turcotte from the Naval Safety Center is serving on
> the investigation board. We in the Navy are also grieving the loss of our
> Naval officer astronauts.
>
> If we in my office can do anything for you, please let us know.
>
> Sincerely,
> Connie

To: prichard@hq.nasa.gov
From: jlemke <jlemke@hq.nasa.gov>
Subject: Fwd: Re: CRS Feb 5 Colombia Report for Congress
Cc:
Bcc:
Attached:

X-Sender: jlloyd@mail.hq.nasa.gov
X-Mailer: QUALCOMM Windows Eudora Version 4.3.2
Date: Sat, 08 Feb 2003 15:28:39 -0500
To: Michael Greenfield <michael.greenfield@hq.nasa.gov>
From: James Lloyd <jlloyd@hq.nasa.gov>
Subject: Re: CRS Feb 5 Colombia Report for Congress
Cc: lgiza@hq.nasa.gov, jlemke <jlemke@hq.nasa.gov>, space@hq.nasa.gov

Michael, Thanks. I had suspected that it had been answered. Can you have someone in your CAC provide the Agency answer on this question to Laura Giza with a copy to me?

Is the Columbia Accident Investigation Board—comprised of current or former government officials—the best group to assist NASA in this investigation, or should non-government experts be included? Should the White House establish an outside commission as was done following the Challenger tragedy in 1986?

At 01:41 PM 2/8/2003 -0500, Michael Greenfield wrote:
already addressed

At 12:04 PM 2/8/2003 -0500, you wrote:
I have a sense that the one you have suggested we answer has been addressed with the White House already in some form. Maybe Scott Pace or Michael Greenfield would know. It would be helpful to see that piece of information before we go ahead and build another similar (dissimilar?) story.

Scott? Michael?

What is deadline?

At 11:42 AM 2/8/2003 -0500, jlemke wrote:
Jim:

Laura Giza (GG) asked Q to take a look at the attached Congressional Research Service report and

draft an answer to "Code Q related questions."

This one looks like ours. Should I start drafting a response?
Is the Columbia Accident Investigation Board—comprised of current or former government officials—the best group to assist NASA in this investigation, or should non-government experts be included? Should the White House establish an outside commission as was done following the Challenger tragedy in 1986?

The rest of the questions look like they belong to the program. The last one is a gem.

I also posted the complete set of questions below.

johnl

John Lemke
Manager, System Safety Engineering
NASA HQ, Code QS
202-358-0567 FAX 358-3104
jlemke@hq.nasa.gov
"Mission success stands on the foundation of our unwavering commitment to safety"
Administrator Sean O'Keefe January 2003

A forthcoming CRS report will explore these issues in more detail, but the following is a brief list of some questions likely to frame the debate. A key factor in evaluating many of these questions is how long the
shuttle system may be grounded. That will not be known until the cause of the accident is determined and remedial steps identified.
! Was funding for the shuttle program adequate to ensure shuttle safety?

! Did NASA adequately respond to concerns expressed over the past several years by the Aerospace Safety Advisory Panel and others that the shuttle program was under stress due to funding and workforce constraints?

! Did NASA adequately investigate damage that might have been caused to Columbia's heat resistant tiles by foam that fell from the External Tank during launch? If Columbia had been damaged, was there anything NASA could have done to ensure the safe return of Columbia's crew, such as launching a rescue mission with another orbiter? Is NASA investigating alternative scenarios in which the tiles could have been damaged, perhaps by space debris during Columbia's 16-day mission?

! Is the Columbia Accident Investigation Board—comprised of current or former government officials—the best group to assist NASA in this investigation, or should non-government experts be included? Should

the White House establish an outside commission as was done following the Challenger tragedy in 1986?

! What are the funding implications of the Columbia accident for the space shuttle program, and for the space station program, which relies on the shuttle for assembly and operation?

! What strategy should guide operation of the International Space Station while the space shuttle system is grounded? Should permanent occupancy of the space station be suspended until the shuttle system is operating again, or should the space station partners (the United States, Russia, Europe, Japan, and Canada) rely on Russian Soyuz and Progress spacecraft to bring crews and cargo to space station?
! If the decision is made to rely on Russian Soyuz and Progress spacecraft beyond those that Russian already has agreed to provide at no cost to the other partners, who will pay for them? In this context, it is important to recall that the Iran Nonproliferation Act (P.L. 106-178) prohibits NASA from making payments to Russia, in cash or in kind, in connection with the space station program unless the President certifies to Congress that Russia is not proliferating nuclear or missile technologies to Iran.
! Should a replacement orbiter be built? If so, how much will it cost and how long will it take? If not, can NASA service the Hubble Space Telescope and continue assembly and operation of the space station with only three orbiters?

! What changes are needed to NASA's recently revised Integrated Space Transportation Plan? Should efforts to develop an Orbital Space Plane, announced in that plan, be accelerated instead of building a replacement for Columbia? To what extent can those plans be accelerated?

! Are the benefits of human spaceflight worth the risks and costs?

A joint hearing between the Senate Commerce Committee and the House Science Committee is scheduled for February 12, 2003.

Jim

Michael A. Greenfield, Ph.D
Associate Deputy Administrator
Technical Programs
NASA Headquarters
phone: 202-358-1820
fax: 202-358-2811

"Mission success stands on the foundation
of our unwavering commitment to safety"

Jim

John Lemke
Manager, System Safety Engineering
NASA HQ, Code QS
202-358-0567 FAX 358-3104
jlemke@hq.nasa.gov
"Mission success stands on the foundation of our unwavering commitment to safety"
Administrator Sean O'Keefe January 2003

Reply-To: jlloyd@mail.hq.nasa.gov
X-Originating-IP: 68.54.247.98
X-URL: http://mail2web.com/
From: "jlloyd@mail.hq.nasa.gov" <jlloyd@mail.hq.nasa.gov>
To: oscar.toledo-1@nasa.gov, humberto.t.garrido@nasa.gov
Cc: jlemke@hq.nasa.gov, prutledg@hq.nasa.gov
Subject: RE: Topical Areas and Q&As
Date: Sun, 9 Feb 2003 17:06:30 -0500
X-OriginalArrivalTime: 09 Feb 2003 22:06:30.0513 (UTC) FILETIME=[7FEBFE10:01C2D087]
X-MIME-Autoconverted: from quoted-printable to 8bit by bolg.public.hq.nasa.gov id RAA22951

Oscar,

We pretty much know what happened with assumptions made about 107. I don't really think that 107 is as important as the dispositions going from 112 to 113. We are developing a story about the SMA involvement with 112, 113, 107 and incipient 114. Your input is welcome. You'll see this some time later this week. What is your input? Give me your perspective; I need your input.

Jim

Original Message:

From: Toledo-1 Oscar Oscar.Toledo-1@nasa.gov
Date: Sun, 9 Feb 2003 11:20:19 -0500
To: jlloyd@hq.nasa.gov, Humberto.T.Garrido@nasa.gov
Subject: RE: Topical Areas and Q&As

Jim,

Thanks for the data. I did a cursory look and it seems like a good set of topical areas with generic and detail policy/requirements flowdown. It should help organize the specific STS-107 questions for the Administrator's testimony. Will you be posting a draft of the final set of specific STS-107 questions integrated into the policy/requirements flowdown for review on the secure website, prior to forwarding to the General Counsel or in parallel, since we have little time left?

Regards,

Oscar

-----Original Message-----
From: James Lloyd

To: smadir@hq.nasa.gov
Cc: prutledg@hq.nasa.gov; prichard@hq.nasa.gov; jlemke
Sent: 2/8/2003 5:48 PM
Subject: Topical Areas and Q&As

Dear SMA Director,

I am enclosing two documents:

The first is the modified topical areas list that we developed several days ago that reflects the work we are doing on the SMA model (built from the SMA requirements). This model was tweaked to cover a broader category of topics. It has also been reported that the General Counsel may be using it as a basis for categorizing their efforts as well although I haven't verified that. (This distribution fulfills an action item I took on Wednesday and again on Friday).

The second document is the set of questions with answers that we are using to prepare for Sean O'Keefe for his testimony to a joint committee next Wednesday. We will most likely continue to review, add and refine this series of Q&As as this process continues. I think I indicated yesterday that I would distribute this (action complete).

These will be posted on the 107 team intranet after we have established its security as this second document is a sensitive document.
<<Topic Areas for Safety and Mission Success.doc>> <<030208 5pm - Topic Areas for Safety and Mission Success.doc>> <<ATT68909.txt>>

Reply-To: jlloyd@mail.hq.nasa.gov
X-Originating-IP: 68.100.166.170
X-URL: http://mail2web.com/
From: "jlloyd@mail.hq.nasa.gov" <jlloyd@mail.hq.nasa.gov>
To: cac@hq.nasa.gov
Cc: jlemke@hq.nasa.gov, prutledg@hq.nasa.gov, mkowales@hq.nasa.gov
Subject: Request for Information
Date: Sun, 9 Feb 2003 09:07:56 -0500
X-OriginalArrivalTime: 09 Feb 2003 14:07:56.0638 (UTC) FILETIME=[A51E5FE0:01C2D044]
X-MIME-Autoconverted: from quoted-printable to 8bit by bolg.public.hq.nasa.gov id JAA21108

We are preparing a timeline of events surrounding four missions: STS112, 113, 107 and 114. Please provide any similar information assembled by the Program so that we may assure that timeline that we are preparing is consistent with facts as presented by the program.

X-Authentication-Warning: spinoza.public.hq.nasa.gov: majordom set sender to owner-press-release using -f
Date: Mon, 3 Feb 2003 16:10:27 -0500 (EST)
From: NASANews@hq.nasa.gov
Subject: SHUTTLE COLUMBIA ACCIDENT PRESS CONFERENCE SCHEDULE CHANGED
Sender: owner-press-release@lists.hq.nasa.gov
To: undisclosed-recipients: ;

Robert Mirelson
Headquarters, Washington
(Phone: 202/3580-1600)

February 3, 2003

Eileen Hawley
Johnson Space Center, Houston
(Phone: 281/483-5111)

RELEASE: 03-044

SHUTTLE COLUMBIA ACCIDENT PRESS CONFERENCE SCHEDULE CHANGED

The press conference schedule for Tuesday, Feb. 4, 2003 has changed.

There will not be a NASA Headquarters press conference at 11:30 a.m. EST on Feb. 4. It has been cancelled out of respect for the Space Shuttle Columbia crew memorial service and to allow NASA employees to watch the tribute.

There will not be a 4:30 EST press conference at the Johnson Space Center tomorrow. The 4:30 EST press conference for Feb. 4, 2003 will be in the NASA Headquarters auditorium, 300 E Street SW, Washington.

The press conference will feature questions from reporters at participating NASA centers and will be broadcast live on NASA Television. There will be an 11:30 a.m. EST press conference at NASA Headquarters and a 4:30 p.m. press conference at the Johnson Space Center on Wednesday, Feb. 5, 2003.

NASA TV is available on AMC-2, transponder 9C, C-Band, located at 85 degrees west longitude. The frequency is 3880.0 MHz. Polarization is vertical and audio is monaural at 6.8 MHz.

Additional information is available on the Internet at:

http://www.nasa.gov

http://spaceflight.nasa.gov

-end-

* * *

X-Authentication-Warning: spinoza.public.hq.nasa.gov: majordom set sender to owner-press-release using -f
Date: Mon, 3 Feb 2003 17:04:35 -0500 (EST)
From: NASANews@hq.nasa.gov
Subject: HANDLE SPACE SHUTTLE DEBRIS WITH CAUTION
Sender: owner-press-release@lists.hq.nasa.gov
To: undisclosed-recipients: ;

Robert Mirelson
Headquarters, Washington
(Phone: 202/358-4495)

February 2, 2003

RELEASE: 03-038

HANDLE SPACE SHUTTLE DEBRIS WITH CAUTION

Debris from the Space Shuttle Columbia may be dangerously contaminated with toxic substances and cause serious injury if handled. Individuals who think they may have come in contact with Shuttle debris should take a shower with soap and water and then seek medical attention.

Individuals are advised to avoid all additional contact with the suspected Shuttle material. Clothing that may have come in contact with the suspected debris should be removed with care to avoid skin contact with cloth that may have been contaminated. Place the clothing in a plastic bag for later analysis.

If your physician has any questions, please have him or her contact the NASA Emergency Action Center at 281/483-3388.

More information is available on the Internet at:

http://www.nasa.gov/columbia/

-end-

* * *

NASA press releases and other information are available automatically

by sending an Internet electronic mail message to domo@hq.nasa.gov. In the body of the message (not the subject line) users should type the words "subscribe press-release" (no quotes). The system will reply with a confirmation via E-mail of each subscription. A second automatic message will include additional information on the service. NASA releases also are available via CompuServe using the command GO NASA. To unsubscribe from this mailing list, address an E-mail message to domo@hq.nasa.gov, leave the subject blank, and type only "unsubscribe press-release" (no quotes) in the body of the message.

X-Authentication-Warning: spinoza.public.hq.nasa.gov: majordom set sender to owner-press-release using -f
Date: Mon, 3 Feb 2003 09:10:17 -0500 (EST)
From: NASANews@hq.nasa.gov
Subject: NASA ANNOUNCES CORRECTED PROCEDURE FOR FILING DAMAGE CLAIMS
Sender: owner-press-release@lists.hq.nasa.gov
To: undisclosed-recipients: ;

Robert Mirelson
Headquarters, Washington
(Phone: 202/358-4495)

February 3, 2003

RELEASE: 03-041

NASA ANNOUNCES CORRECTED PROCEDURE FOR FILING DAMAGE CLAIMS

NASA is accepting claims from individuals who may have suffered damage due to the Space Shuttle Columbia mishap. Any person desiring to file a claim should complete U.S. Government Standard Form 95, "Claim for Damage, Injury, or Death" and send it to the closest of these NASA offices.

Office of the Chief Counsel
NASA Johnson Space Center
Mail Code: AL
2101 NASA Road 1
Houston, TX 77058
(281) 483-3021

Office of the General Counsel
NASA Headquarters
Mail Code: G
300 E St., SW
Washington, DC 20546
(202) 358-2450

Office of Chief Counsel
NASA Stennis Space Center
Mail Code: CA00
Building 1100
Stennis Space Center, MS 39529
(228) 688-2164

For more information on filing a claim, including downloadable forms, call any of the above offices or go to:

www.hq.nasa.gov/ogc/general_law/torttext.html

-end-

* * *

NASA press releases and other information are available automatically by sending an Internet electronic mail message to domo@hq.nasa.gov. In the body of the message (not the subject line) users should type the words "subscribe press-release" (no quotes). The system will reply with a confirmation via E-mail of each subscription. A second automatic message will include additional information on the service. NASA releases also are available via CompuServe using the command GO NASA. To unsubscribe from this mailing list, address an E-mail message to domo@hq.nasa.gov, leave the subject blank, and type only "unsubscribe press-release" (no quotes) in the body of the message.

To: Pat Martin <pmartin@mail.hq.nasa.gov>
From: jlemke <jlemke@hq.nasa.gov>
Subject: Fwd: NASA ANNOUNCES SPACE SHUTTLE COLUMBIAACCIDENT INVESTIGATION BOARD (THE GEHMAN BOARD)
Cc:
Bcc:
Attached:

X-Authentication-Warning: spinoza.public.hq.nasa.gov: majordom set sender to owner-press-release using -f
Date: Sun, 2 Feb 2003 08:40:25 -0500 (EST)
From: NASANews@hq.nasa.gov
Subject: NASA ANNOUNCES SPACE SHUTTLE COLUMBIAACCIDENT INVESTIGATION BOARD (THE GEHMAN BOARD)
Sender: owner-press-release@lists.hq.nasa.gov
To: undisclosed-recipients: ;

Glenn Mahone/Bob Jacobs
Headquarters, Washington
(Phone: 202/358-1898/1600)

February 2, 2003

RELEASE: 03-034

NASA ANNOUNCES SPACE SHUTTLE COLUMBIA ACCIDENT INVESTIGATION BOARD (THE GEHMAN BOARD)

NASA Administrator Sean O'Keefe today announced the members of the Space Shuttle Mishap Interagency Investigation Board, which will provide an independent review of the events and activities that led up to the tragic loss of the seven astronauts Saturday on board the Space Shuttle Columbia.

The board's first meeting is scheduled for tomorrow at Barksdale Air Force Base in Louisiana.

Retired U.S. Navy Admiral Harold W. Gehman, Jr., who co-chaired the independent commission that investigated the attack on the U.S.S. Cole in Aden, Yemen, Oct. 12, 2000, and once served as the commander-in-chief of U.S. Joint Forces Command, will chair the panel.

"While the NASA family and the entire world mourn the loss of our colleagues, we have a responsibility to quickly move forward with an external assessment to determine exactly what happened and why," said Administrator O'Keefe. "We're honored

to have such a distinguished panel of experts, led by Admiral Gehman."

Other members of the investigative board includes:

* Rear Admiral Stephen Turcotte, Commander, U.S. Naval Safety Center, Norfolk, Va.
* Major General John L. Barry, Director, Plans and Programs, Headquarters Air Force Materiel Command, Wright-Patterson Air Force Base, Ohio
* Major General Kenneth W. Hess, Commander, U.S. Air Force Chief of Safety, Kirtland Air Force Base, N.M.
* Dr. James N. Hallock, Aviation Safety Division Chief, U.S. Department of Transportation, Cambridge, Mass.
* Steven B. Wallace, Director of Accident Investigation, Federal Aviation Administration, Washington
* Brigadier General Duane Deal, Commander 21st Space Wing, Peterson Air Foce Base, Colo.

Several senior NASA leaders also will be a part of the panel, including G. Scott Hubbard, Director, NASA Ames Research Center, Moffett Field, Calif. Bryan D. O'Connor, NASA Associate Administrator and former astronaut, Office of Safety and Mission Assurance, Headquarters, will serve as Ex-Officio Member, and Theron Bradley, Jr., NASA Chief Engineer, NASA Headquarters, Washington, will be Executive Secretary.

"We need to be responsible, accountable, and extremely thorough in this investigation," added Administrator O'Keefe. 'This panel is charged with a most difficult task, but I am confident in their ability, their integrity, and their dedication to doing what's right. Their findings will help push America's space program successfully into the future."

"Currently, NASA is beginning an internal investigation, drawing on the extensive expertise throughout the agency. Public officials for NASA, the Federal Emergency Management Agency, and other federal, state, and local entities are coordinating talents to help find the cause of this tragedy," concluded Administrator O'Keefe

Additional information about the investigation and the STS-107 mission is available on the Internet at:

http://www.nasa.gov

http://spaceflight.nasa.gov

-end-

* * *

NASA press releases and other information are available automatically by sending an Internet electronic mail message to domo@hq.nasa.gov. In the body of the message (not the subject line) users should type the words "subscribe press-release" (no quotes). The system will reply with a confirmation via E-mail of each subscription. A second automatic message will include additional information on the service. NASA releases also are available via CompuServe using the command GO NASA. To unsubscribe from this mailing list, address an E-mail message to domo@hq.nasa.gov, leave the subject blank, and type only "unsubscribe press-release" (no quotes) in the body of the message.

John Lemke
Manager, System Safety Engineering
NASA HQ, Code QS
202-358-0567 FAX 358-3104
jlemke@hq.nasa.gov

"Mission success stands on the foundation of our unwavering commitment to safety"
Administrator Sean O'Keefe January 2003

X-Sender: boconnor@mail.hq.nasa.gov
X-Mailer: QUALCOMM Windows Eudora Version 4.3.2
Date: Mon, 03 Feb 2003 07:51:59 -0500
To: touhara kazuyuki <touhara.kazuyuki@nasda.go.jp>
From: boconnor <boconnor@hq.nasa.gov>
Subject: Re: Proposal: Safety and Mission Assurance (SMA)
InformationExchange Meeting
Cc: fujita.toshihiko@nasda.go.jp, alex.soons@esa.int, Willy.Jongkind@esa.int,
eraynor@hq.nasa.gov, jlloyd@hq.nasa.gov, prutledg@hq.nasa.gov,
jlemke@hq.nasa.gov, twijdoog@hq.nasa.gov

Mr. Kazayuki,

Thank you very much for your support and expression of sympathy. I cannot say at this time what June will look like, but if it looks like we should postpone our meeting, I will give you advanced notice.
Best Regards,

At 04:56 PM 2/3/2003 +0900, touhara kazuyuki wrote:
Dear O'Connor

We at NASDA were deeply grieved to hear the loss of
seven astronauts and Space Shuttle Columbia
on 1st February and wish to express our
heartfelt condolences.

You and Office of Safety and Mission Assurance
may play an important role to investigate
the cause and set corrective action for this tragedy.
We hope that efforts of you and your members will
overcome the difficulties and bring early and firm
restart of Space Shuttle flights.

Also if you wish to postpone the first
NASA/ESA/NASDA S&MA meeting proposed in coming June,
we will be awaiting your announcement for having meeting.

Sincerely Yours

Toshihiko Fujita

boconnor wrote:
>
> Dear Mr. Fujita and Mr. Soons:
>
> I am inquiring about the availability of you and your staff to visit NASA
> Headquarters in Washington DC in June of 2003 for a trilateral ESA, NASDA,
> an NASA Safety and Mission Assurance (SMA) Information Exchange Meeting. I
> propose a four day meeting during June 16-19, 2003; please let me know if
> these proposed meeting dates are acceptable with your schedules.
>
> We have much to talk about and share with you when we meet. In the interim
> I would like to apprise you of several key management changes within our
> Office of Safety And Mission Assurance (Code Q). I believe you may know
> that I have been assigned as Associate Administrator for Safety and Mission
> Assurance since early June of 2003; I was a former astronaut and have also
> served as a Deputy Associate Administrator for Space Flight (Code M) so I
> am well acquainted with NASA and the rigors of the aerospace business. I
> succeeded Mr. Frederick D. Gregory, who after a brief period as the
> Associate Administrator for Space Flight (Code M) has now been appointed as
> the Agency's Deputy Administrator (Code AD). Our Deputy Associate
> Administrator for Safety and Mission Assurance, Dr. Michael A. Greenfield,
> has recently been promoted to the position of Associate Deputy
> Administrator for Technical Programs (Code AI), reporting directly to Mr.
> Gregory. As a result I have asked Jim Lloyd to act as our office's Deputy
> Associate Administrator until I select or announce a permanent
> replacement. Concurrent with these personnel changes is a reorganization
> of the Code Q Divisions. What used to be two divisions (QE and QS) are now
> soon to be three (QE, QS, and QV). The new division, QV, will focus
> exclusively on internal assessment and review activities; Dr. Pete Rutledge
> will be the acting head of this division until a permanent placement is
> selected and announced. Enclosed is a provisional NASA Headquarters Office
> of Safety and Mission Assurance organization chart to introduce these
> changes and initial personnel placements.
>
> I have asked Mr. Eric Raynor, of my staff, to assist me with the
> coordination and preparation for our June meeting; he may be reached at
> eraynor@hq.nasa.gov and should be included on all future correspondence
> regarding this planned event. I look forward to your confirmation of our
> meeting plans and I wish you both a very happy new year!
>
> Cordially,

> Bryan O'Connor
> Associate Administrator
> Safety and Mission Assurance
> NASA Headquarters
> Mail Code Q
> 300 E. Street, SW
> Washington, DC 20546
> (202) 358-2406
>
> ---
> Name: OSMA Org 1-17-03.ppt
> OSMA Org 1-17-03.ppt Type: Microsoft PowerPoint $B%W%l%<%s%F!<%7%g%s(B (application/x-mspowerpoint)
> Encoding: base64

Bryan O'Connor
Associate Administrator
Office of Safety and Mission Assurance

X-Sender: wfrazier@mail.hq.nasa.gov
X-Mailer: QUALCOMM Windows Eudora Version 4.3.2
Date: Sun, 02 Feb 2003 15:29:25 -0500
To: njohnson@ems.jsc.nasa.gov
From: "Wayne R. Frazier" <wfrazier@hq.nasa.gov>
Subject: 107 debris risk
Cc: jlemke@hq.nasa.gov, jlloyd@hq.nasa.gov, mkowales@mail.hq.nasa.gov,
wbihner@hq.nasa.gov, whill@hq.nasa.gov

Nick,

I am sure you have already been thinking this, but what were the risk numbers for this profile. I know that some science missions and their orientations drive us to higher chance of on orbit hits. Also, do you know if anything was predicted to be reentering thru the area at the time?

We should definitely investigate to cross off the list!

W

~~~~~~
Wayne R. Frazier
NASA Headquarters - Code QS
Office of Safety and Mission Assurance
Washington,DC 20546-0001
Ph: 202 358-0588 Fax: 202 358-3104
~~~~~~

"Mission success starts with safety"

From: "NAKAMURA, STACEY T. (JSC-NS) (NASA)" <stacey.t.nakamura@nasa.gov>
To: "'jlemke@hq.nasa.gov'" <jlemke@hq.nasa.gov>,
"'jmullin@hq.nasa.gov'"
<jmullin@hq.nasa.gov>
Subject: FW: FW: New Website for JSC Employees: Shuttle Columbia Tragedy
Date: Sun, 2 Feb 2003 13:50:04 -0600
X-Mailer: Internet Mail Service (5.5.2653.19)

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

-----Original Message-----
From: James Lloyd [mailto:jlloyd@hq.nasa.gov]
Sent: Sunday, February 02, 2003 12:00 PM
To: smadir@hq.nasa.gov
Cc: NAKAMURA, STACEY T. (JSC-NS) (NASA)
Subject: Fwd: FW: New Website for JSC Employees: Shuttle Columbia Tragedy

Dear SMA Director,

Stacey has passed this information along for insight into information about STS107.

>From: "NAKAMURA, STACEY T. (JSC-NS) (NASA)" <stacey.t.nakamura@nasa.gov>
>To: "'Jonathan B. Mullin'" <jmullin@hq.nasa.gov>, jlloyd@hq.nasa.gov
>Subject: FW: New Website for JSC Employees: Shuttle Columbia Tragedy
>Date: Sun, 2 Feb 2003 10:07:57 -0600
>X-Mailer: Internet Mail Service (5.5.2653.19)
>
>FYI...very helpful information. Mike Stewart is the IT guru at JSC Human
>Resources. The websites he creates are often cloned for other Centers, so
>he may have already set up similar website for the Agency. But, just in
>case, here is the weblink. You may want to reforward to the S&MA email
>distribution.
>
>Regards,
>Stacey
>

>-
>Stacey T. Nakamura
>Phone: (281) 483-4345
>Fax: (281) 483-6275
>
> > -----Original Message-----
> > From: HR E-Mail Notification System
> > Sent: Saturday, February 01, 2003 6:17 PM
> > To: DL JSC Civil Servants; DL JSC Contractors
> > Subject: New Website for JSC Employees: Shuttle Columbia Tragedy
> >
> > We've activated a new webpage to assist you and your co-workers within the
> > JSC workforce as we deal with the Shuttle Columbia Tragedy. You may search
> > this page for the latest information on the Center's workforce activities,
> > services, and resources related to this tragedy.
> >
> > http://jscpeople.jsc.nasa.gov/columbia/
> >
> >

****

James D. Lloyd (Jim)

Acting Deputy Associate Administrator
Office of Safety and Mission Assurance
Headquarters Room 5U11
desk phone 202-358-0557
cellular
fax 202-358-3104

"Mission success stands on the foundation of our unwavering commitment to safety"
Administrator Sean O'Keefe January 2003

X-Sender: jmullin@mail.hq.nasa.gov
X-Mailer: QUALCOMM Windows Eudora Version 4.3.2
Date: Sun, 02 Feb 2003 14:56:02 -0500
To: Catherine.Angotti@hq.nasa.gov
From: "Jonathan B. Mullin" <jmullin@hq.nasa.gov>
Subject: Fwd: FW: New Website for JSC Employees: Shuttle Columbia Tragedy
Cc: jlemke@hq.nasa.gov

Cathy, is this good enough to send to all of our safety directors? Let me know. Regards, Jon
From: "NAKAMURA, STACEY T. (JSC-NS) (NASA)" <stacey.t.nakamura@nasa.gov>
To: "'Jonathan B. Mullin'" <jmullin@hq.nasa.gov>, jlloyd@hq.nasa.gov
Subject: FW: New Website for JSC Employees: Shuttle Columbia Tragedy
Date: Sun, 2 Feb 2003 10:07:57 -0600
X-Mailer: Internet Mail Service (5.5.2653.19)

FYI...very helpful information. Mike Stewart is the IT guru at JSC Human Resources. The websites he creates are often cloned for other Centers, so he may have already set up similar website for the Agency. But, just in case, here is the weblink. You may want to reforward to the S&MA email distribution.

Regards,
Stacey

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

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> From: HR E-Mail Notification System
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> To: DL JSC Civil Servants; DL JSC Contractors
> Subject: New Website for JSC Employees: Shuttle Columbia Tragedy
>
> We've activated a new webpage to assist you and your co-workers within the
> JSC workforce as we deal with the Shuttle Columbia Tragedy. You may search
> this page for the latest information on the Center's workforce activities,
> services, and resources related to this tragedy.
>
> http://jscpeople.jsc.nasa.gov/columbia/
>
>

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"

From: Jim Lloyd <jlloyd@hq.nasa.gov>
To: <dvecellio@arescorporation.com>, <snewman@hq.nasa.gov>,
<boconnor@hq.nasa.gov>, <prutledg@hq.nasa.gov>, <jlloyd@hq.nasa.gov>,
<pnapala@hq.nasa.gov>, <wfrazier@hq.nasa.gov>, <fchandle@hq.nasa.gov>,
<Tom.Whitmeyer@hq.nasa.gov>, <mkowales@hq.nasa.gov>,
<wbihner@mail.hq.nasa.gov>, <jlemke@hq.nasa.gov>,
<Laura.W.Doty@nasa.gov>, <Humberto.T.Garrido@nasa.gov>,
<Amanda.H.Goodson@nasa.gov>, <Michael.Smiles@ssc.nasa.gov>,
<yolanda.y.marshall@nasa.gov>, <mark.d.erminger@nasa.gov>,
<sbartell@ksc.nasa.gov>, <A.H.Phillips@larc.nasa.gov>,
<Wentworth.O.Denoon@nasa.gov>, <jmullin@hq.nasa.gov>
X-your-intranet: http://107team.intranets.com
X-Intranets-helpdesk: mailto:help@intranets.com
Date: Sun, 02 Feb 2003 05:34:27 GMT
X-mailer: AspMail 4.0 4.03 (SMT412E7EF)
Subject: SMA Telecon
X-OriginalArrivalTime: 02 Feb 2003 05:34:29.0469 (UTC) FILETIME=[C1B930D0:01C2CA7C]

Here's a new posting on 107 Team that I'd like you to see. To go directly to the posting, click the link below or paste it into your web browser. Please note that some email clients require that all the letters and numbers in the link appear on one line, or else it won't go to the right place.

<http://107team.intranets.com/r.asp?a=3&id=8529>

From: "Dr. J. Steven Newman" <welcome@intranets.com>
To: <jlemke@hq.nasa.gov>
Reply-to: snewman@hq.nasa.gov
X-your-intranet-is: http://107team.intranets.com
X-for-help-with-Intranets: mailto:support@intranets.com
Date: Sat, 01 Feb 2003 22:27:39 GMT
X-mailer: AspMail 4.0 4.03 (SMT412E7EF)
Subject: An Invitation from Dr. J. Steven Newman
X-OriginalArrivalTime: 01 Feb 2003 22:27:39.0764 (UTC) FILETIME=[21265340:01C2CA41]

Dear John,

We've set up an intranet for 107 Team and want you to check it out.

Here's a personal message from Dr. J. Steven Newman:
****
Team 107 has been establish to provide a communication clearinghouse
for NASA personnel involved in the recovery and mishap investigation
activities associated with the tragic loss of STS-107.

Key areas to visit include:
1. Documents
2. Members
3. Contacts

****

Our intranet is our group's private website. We can use it to share
group documents, schedule events, hold online discussions, and more.
Only people who are invited to join can become members. I've created
a temporary login name and password to make it easy for you to access
our site.

GETTING STARTED: To become a permanent member, all you have to do
is complete your registration when you log in.

To begin, click here:

<http://107team.intranets.com/login.asp?tmplogin=jlemke&tmppswd=MTA3dGVhbQ&addcommand=accept
>

Or go to http://107team.intranets.com and enter the following login
information:

Login Name: jlemke

Password: MTA3dGVhbQ

If you are not interested in participating, you can decline your membership by clicking here:

http://107team.intranets.com/login.asp?tmplogin=jlemke&tmppswd=MTA3dGVhbQ&addcommand=decline>

I hope to see you soon in our intranet!

Regards,
Dr. J. Steven

From: 'Dr. J. Steven Newman" <snewman@hq.nasa.gov>
To: <dvecellio@arescorporation.com>, <snewman@hq.nasa.gov>,
<boconnor@hq.nasa.gov>, <prutledg@hq.nasa.gov>, <jlloyd@hq.nasa.gov>,
<pnapala@hq.nasa.gov>, <wfrazier@hq.nasa.gov>, <fchandle@hq.nasa.gov>,
<Tom.Whitmeyer@hq.nasa.gov>, <mkowales@hq.nasa.gov>,
<wbihner@mail.hq.nasa.gov>, <jlemke@hq.nasa.gov>,
<Laura.W.Doty@nasa.gov>, <Humberto.T.Garrido@nasa.gov>,
<Amanda.H.Goodson@nasa.gov>, <Michael.D.Smiles@nasa.gov>,
<yolanda.y.marshall@nasa.gov>, <mark.d.erminger@nasa.gov>,
<A.H.Phillips@larc.nasa.gov>, <Wentworth.O.Denoon@nasa.gov>,
<jmullin@hq.nasa.gov>, <alex.c.adams@nasa.gov>,
<Clifton.T.Arnold@nasa.gov>, <matthew.bettridge@fema.gov>,
<Steven.Brisbin-1@ksc.nasa.gov>, <david.m.browne1@jsc.nasa.gov>,
<mcard@mail.hq.nasa.gov>, <jcastell@mail.hq.nasa.gov>,
<ron.castleman@fema.gov>, <Nick.A.Cenci@nasa.gov>,
<Lawrence.R.Davis@nasa.gov>, <John.Dollberg-1@ksc.nasa.gov>,
<james.duffer@fema.gov>, <moises.dugan@fema.gov>,
<mgaier@mail.hq.nasa.gov>, <Mark.Gordon-1@ksc.nasa.gov>,
<dominic.l.gorie1@jsc.nasa.gov>, <mgreenfi@mail.hq.nasa.gov>,
<Michael.Haddad-1@ksc.nasa.gov>, <wharkins@mail.hq.nasa.gov>,
<william.j.harris1@jsc.nasa.gov>, <William.Higgins-1@ksc.nasa.gov>,
<malcolm.j.himel1@jsc.nasa.gov>, <jerry.b.holsomback1@jsc.nasa.gov>,
<Sharolee.Huet-1@ksc.nasa.gov>, <Bruce.Jansen-1@ksc.nasa.gov>,
<m.s.johnson@nasa.gov>, <Wayne.Kee-1@ksc.nasa.gov>,
<mlandano@mailhost4.jpl.nasa.gov>, <Roger.Langevin-1@ksc.nasa.gov>,
<Edmundo.Lebron-1@ksc.nasa.gov>, <jlyver@mail.hq.nasa.gov>,
<roy.w.malone@nasa.gov>, <pmartin@mail.hq.nasa.gov>,
<daniel.j.mullane@nasa.gov>, <rpatrica@mail.hq.nasa.gov>,
<pphillip@mail.hq.nasa.gov>, <eraynor@mail.hq.nasa.gov>,
<scott.a.seyl1@jsc.nasa.gov>, <lsirota@hq.nasa.gov>,
<mstamate@mail.hq.nasa.gov>, <Michael.Stevens-1@ksc.nasa.gov>,
<Burton.Summerfield-1@ksc.nasa.gov>, <david.f.thelen1@jsc.nasa.gov>,
<Randall.Tilley-1@ksc.nasa.gov>; <swander@hq.nasa.gov>,
<Vernon.W.Wessel@grc.nasa.gov>, <gwhite1@mail.hq.nasa.gov>,
<david.w.whittle1@jsc.nasa.gov>, <gary.w.johnson@nasa.gov>,
<Oscar.Toledo-1@nasa.gov>, <joan.w.broadfoot@nasa.gov>,
<deborah.s.bazan1@jsc.nasa.gov>, <Brenda.P.Willis@nasa.gov>,
<john.h.casper1@jsc.nasa.gov>, <david.cazes1@jsc.nasa.gov>,
<Joseph.C.Cianciola@nasa.gov>, <frank.l.culbertson1@jsc.nasa.gov>,
<Angela.V.Daniels@msfc.nasa.gov>, <Diana.Heberling@ssc.nasa.gov>,
<marla.g.duhon1@jsc.nasa.gov>, <keith.w.dyer1@jsc.nasa.gov>,
<richard.d.gardner1@jsc.nasa.gov>, <whill@mail.hq.nasa.gov>,
<cheryl.a.inman1@jsc.nasa.gov>, <Leigh.Martin@msfc.nasa.gov>,
<hugo.e.martinez1@jsc.nasa.gov>, <desiree.c.patterson1@jsc.nasa.gov>,
<Robert.Nagy-1@ksc.nasa.gov>, <cyndi.l.skains1@jsc.nasa.gov>,
<Stephen.Ernest-1@ksc.nasa.gov>, <elizabeth.torres1@jsc.nasa.gov>,

<Vicki.W.Rorex@msfc.nasa.gov>, <angelia.d.walker@nasa.gov>,
<rosalyn.m.patrick@nasa.gov>, <randall.h.tucker@nasa.gov>,
<foster.e.anthony@nasa.gov>, <mike.kennedy@msfc.nasa.gov>,
<allan.k.layne@nasa.gov>, <lwalton@arescorporation.com>,
<rmoyer@mail.hq.nasa.gov>, <ajohnson@mail.hq.nasa.gov>,
<Donald.J.Campbell@grc.nasa.gov>, <prichard@mail.hq.nasa.gov>,
<Thomas.W.Hartline@nasa.gov>
X-your-intranet: http://107team.intranets.com
X-Intranets-helpdesk: mailto:help@intranets.com
Date: Tue, 04 Feb 2003 15:38:02 GMT
X-mailer: AspMail 4.0 4.03 (SMT412E7EF)
Subject: 107-Team
X-OriginalArrivalTime: 04 Feb 2003 15:38:09.0679 (UTC) FILETIME=[6B7A21F0:01C2CC63]

107-Team

Reminder: This functionality is operating on a third party server operating under an approved, NASA NPG 2810 compliant IT security plan.

As discussed in our telecons the site operates under a set of special ground rules: No ITAR Data, No Export Controlled Data, No Competition Sensitive Data. We can add to that No Investigation Sensitive Data.

Please call if you have any questions (202-358-1408).

Regards/Steve

The site will continue to support NASA SMA community in communication (members & contacts) and public domain information / document / link exchange to support NASA SMA 107-activity.

We are working with GRC and NASA IT community to implement an Enhanced Security functionality that will allow sharing of sensitive information (data covered under ITAR/Export Control). More on this capability in the near future.

X-Sender: wfrazier@mail.hq.nasa.gov
X-Mailer: QUALCOMM Windows Eudora Version 4.3.2
Date: Wed, 05 Feb 2003 10:08:32 -0500
To: hcat@hq.nasa.gov
From: "Wayne R. Frazier" <wfrazier@hq.nasa.gov>
Subject: Defense Intelligence offer
Cc: whill@hq.nasa.gov, prichard@hq.nasa.gov, jlloyd@hq.nasa.gov,
jlemke@hq.nasa.gov, prutledg@hq.nasa.gov, jmullin@hq.nasa.gov

This date received an offer from DIA (Bill Hungate through a third party)at Patrick AFB to offer DIA services to overfly the crash site with a hyperspectral scanner that has 3" resolution for hard objects in vegetation. Passed to Jon Mullin in Code QS who called FEMA EST rep Justin Tillman (646.2461) who called back and recommended we have DIA Patrick call Mr. Wayne Farley at the Lufkin DFO at 318.456.7238. Called DIA back at 0950 Feb 5 and talked to LTC Jeff Grantham (321.494.6240)who will contact Lufkin DFO.

Wayne

~~~~~~

Wayne R. Frazier
NASA Headquarters - Code QS
Office of Safety and Mission Assurance
Washington,DC 20546-0001
Ph: 202 358-0588 Fax: 202 358-3104

~~~~~~

"Mission success starts with safety"

X-Sender: wfrazier@mail.hq.nasa.gov
X-Mailer: QUALCOMM Windows Eudora Version 4.3.2
Date: Wed, 05 Feb 2003 11:23:43 -0500
To: Tsabikos Papadimitris <Tsabikos.A.Papadimitris@nasa.gov>
From: "Wayne R. Frazier" <wfrazier@hq.nasa.gov>
Subject: Re: Fwd: Message from A.V. Diaz, Director
Cc: prichard@hq.nasa.gov, jlemke@hq.nasa.gov, prutledg@hq.nasa.gov, jlloyd@hq.nasa.gov

thanks Charlie,At 08:45 AM 2/5/2003 -0500, you wrote:
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
****

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Wayne R. Frazier
NASA Headquarters - Code QS
Office of Safety and Mission Assurance
Washington,DC 20546-0001
Ph: 202 358-0588 Fax: 202 358-3104

~~~~~~

"Mission success starts with safety"

</x-html>

X-Sender: lloewy@mail.hq.nasa.gov
X-Mailer: QUALCOMM Windows Eudora Version 4.3.2
Date: Wed, 05 Feb 2003 15:06:46 -0500
To: dmoore@hq.nasa.gov
From: Lynne Loewy <lloewy@hq.nasa.gov>
Subject: WAR
Cc: prutledg@hq.nasa.gov, jlemke <jlemke@hq.nasa.gov>

Dale:

Do you think it would be acceptable, for the WAR, for tomorrow's submission, to simply say the following:

The Office of Safety and Mission Assurance is supporting activities associated with the loss of STS-107.

The guys just don't have time for this...

To: code-qs@lists.hq.nasa.gov, code-qe@lists.hq.nasa.gov
From: jlemke <jlemke@hq.nasa.gov>
Subject: FYI: ASAP "firings" article from Govt Exec
Cc: mgreenfi@hq.nasa.gov, Len Sirota <lsirota@mail.hq.nasa.gov>
Bcc:
Attached:

February 6, 2003

NASA denies allegations surrounding dismissal of safety advisers

By Beth Dickey
webmaster@govexec.com

Top managers at the National Aeronautics and Space Administration are reacting with surprise to a published report that claims the agency dismissed several of its top safety advisers because it did not agree with their advice.

NASA fired five members of its independent Aerospace Safety Advisory Panel and two of the panel's consultants last year after an expert warned that the U.S. shuttle fleet would have safety problems if the agency's budget was not increased, according to a Feb. 3 report in The New York Times. The newspaper said a sixth member resigned in anger over the firings.

"I'm surprised," NASA Administrator Sean O'Keefe told CNN on Feb. 3, two days after the shuttle Columbia, streaking home to Florida from a 16-day science mission, broke apart and rained debris and human remains over as many as five states. "[The panel is] a valuable source of advice and recommendations to us and we've acted upon those," O'Keefe said.

Former panelists accused NASA of "developing institutional myopia" about the panel's warnings and observations, according to the newspaper. The Aerospace Safety Advisory Panel's most recent report, released in March 2002, said that while safety had not yet been compromised, "the current and proposed budgets are not sufficient to improve or even maintain the safety risk level" of operating the shuttle and the U.S.-led international space station. A month after the report came out, ousted ASAP Chairman Richard Blomberg told Congress, "I have never been as worried for space shuttle safety as I am right now."

NASA officials acknowledged replacing the panelists, but said it did so in an effort to infuse the panel with fresh talent and expertise. In a news conference, NASA Administrator William Readdy denied the panelists were fired. "They provide us with expert advice and we value the reports they generate," he said. Several individuals, including Blomberg, had served an average of 12 years and were forced out when the agency decided in April 2001 to limit terms of service to six years.

The change in the charter created vacancies on the panel that were filled by several people with an intimate knowledge of the space shuttle program. Retired Air Force Lt. Gen. Forrest McCartney, director of Florida's Kennedy Space Center during NASA's recovery from the 1986 Challenger disaster, is vice chairman on the panel. Members include former Shuttle Commander Sidney Gutierrez and aerospace consultant Robert Sieck, who directed shuttle processing at Kennedy in the 1990s. Former astronaut Bernard Harris is among the panel's consultants.

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X-Authentication-Warning: spinoza.public.hq.nasa.gov: majordom set sender to owner-code-qe using -f
X-Sender: jlemke@mail.hq.nasa.gov
X-Mailer: QUALCOMM Windows Eudora Version 4.3.2
Date: Wed, 12 Feb 2003 09:18:23 -0500
To: code-qe@lists.hq.nasa.gov, code-qs@lists.hq.nasa.gov
From: jlemke <jlemke@hq.nasa.gov>
Subject: Challenge for Columbia investigators: handling classified
Sender: owner-code-qe@lists.hq.nasa.gov

6. Challenge for Columbia investigators: handling classified information

COLORADO SPRINGS, Colo. - One challenge facing the board investigating the breakup of the space shuttle Columbia is deciding how to handle potentially sensitive information from a variety of government sensors that monitored the orbiter in its final minutes.

Any data gathered by ground-based missile defense radars, for instance, "could be and probably is classified if it would reveal ... operational capabilities," said Lt. Col. Andy Roake, a spokesman for Air Force Space Command (AFSPC) at Peterson Air Force Base here.

"I know that they're working out the processes" for using such information in the investigation, he said. "The Air Force is committed to providing them with any kind of information that will help. ... It may be just a matter of providing the few people who are part of the investigation [with] that data and basically allowing them to see that on an as-needed basis."

The quantity of data probably won't be a problem. "We have a lot of capability in this country in our national means and there was a lot of attention directed" at the shuttle's return because interest in such events is always high, Michael C. Kostelnik, NASA's deputy associate administrator for the space shuttle program, said last week. He said it's "not unusual ... for a lot of entities to take pictures because it exercises their system on a very useful target. That happens routinely whether you ask for it or not."

Beyond handling sensitive data from specific sensors will be the task of correlating such data from several sensors and linking it to information transmitted by the orbiter itself in its last minutes.

Among government sensors that may offer critical information are Defense Support Program early warning satellites and ground radars, a team intended to help confirm a missile attack. Both have a side mission of helping to monitor objects in space. One DSP satellite is parked over the equator near the East Coast of the U.S and another is located near the West Coast, according to Jeffrey Richelson, an intelligence expert with the Washington-based National Security Archive.

The Ballistic Missile Early Warning System (BMEWS) radars, AFSPC spokesman Roake said, are located at Eglin Air Force Base, Fla.; Thule, Greenland; and Fylingdales, United Kingdom. Two Pave Paws radars, located at Beale Air Force Base, Calif., and Cape Cod, Mass., also are designed to warn of missile attack.

A telescope at the Air Force Research Lab's Starfire Optical Range at Kirtland Air Force Base, N.M., has yielded an image of Columbia in its final moments, but its precise meaning apparently is not yet clear. Roake said the image

was "from a side telescope. It wasn't from the main Starfire optical scope, it was more like a spotting scope ... so it's kind of fuzzy. With the main telescope you could capture images a lot better."

Telescopes of the Ground-based Electro Optical Deep Space Surveillance (GEODSS) system, with one site in Socorro, N.M., may have captured images useful in the investigation, Roake said.

Information from GEODSS and similar systems routinely flows into AFSPC's 1st Space Control Squadron at Cheyenne Mountain, Colo., which normally passes it to NASA so the orbits of shuttles and the International Space Station can be adjusted to avoid space debris.

In the wake of the Columbia disaster, all information gathered by Department of Defense sensors is being sent to accident investigators through U.S. Strategic Command in Omaha, Neb., Roake said.

- Rich Tuttle (richtut@aol.com)

From: "JOHNSON, GARY W. (JSC-NA) (NASA)" <gary.w.johnson@nasa.gov>
To: "'Lloyd, James(Code Q)'" <jlloyd@hq.nasa.gov>,
"'Pete Rutledge'"
<prutledg@hq.nasa.gov>,
"'Newman, Steve (CodeQ)'" <snewman@hq.nasa.gov>
Subject: FW: Procedure for Accepting & Regulating STS 107 Debris & Materia
l at JSC
Date: Mon, 10 Feb 2003 08:47:04 -0600
X-Mailer: Internet Mail Service (5.5.2653.19)

Jim & Pete FYI
> -----Original Message-----
> From: HR E-Mail Notification System
> Sent: Friday, February 07, 2003 3:57 PM
> To: DL JSC Civil Servants; DL JSC Contractors
> Subject: Procedure for Accepting & Regulating STS 107 Debris &
> Material at JSC
>
> As NASA and JSC continue to expand their efforts to inspect and examine
> every sort of debris, film, video, or other material relating to the
> Shuttle Columbia, STS-107 accident, the following procedure will be
> implemented Monday, February 10th, by the JSC Emergency Operations Center
> (EOC) for material arriving at JSC from external sources. The purpose of
> this procedure is to ensure the safety of NASA government employees,
> contractors and private citizens, as well as ensure accurate processing
> and cataloging of STS-107 debris and other materials. Adherence to this
> procedure will ensure that no clue is overlooked and will greatly assist
> the investigation teams. This procedure only applies to physical material
> arriving from external sources (e.g. debris field or other accident
> observers) and does not apply to investigation related materials being
> generated at JSC or other NASA centers and NASA contractors such as
> mission telemetry, analysis, schematics, or computer models.
>
> The JSC Shuttle office is mandating that all debris material relating to
> the STS-107 accident, whether received via mail, delivery service, freight
> shipment, hand carried or other means must go to the JSC Central Receiving
> office at Bldg. 421. At Central Receiving each item will be examined to
> verify its safety before being cataloged and routed to the proper storage
> location or organization. For picking up STS-107 debris, that is already
> being held or stored at JSC which has not been screened, please call
> Denton Crotchett for pickup.
>
> The following numbers and/or points of contact can be used to answer your
> questions regarding this policy.
> a. Occupational Health - Denton Crotchett, Occupational Health
> Services, phone 281-483-6726.
> b. Safety Duty Phone - 281-705-0633
> c. Logistics Duty Phone - 281-799-1851 or pager
> d. Security Office - Mr. Bob Crow, JSC Security Office, phone

> 281-483-2350; pager :
> e. Emergency Operations Center: 281-483-3388
> f. Engineering Directorate - John Muratore pager
>
> For additional information concerning these procedures, see the JSC
> Columbia Tragedy website. <http://jscpeople.jsc.nasa.gov/columbia/>
>
>

From: "Clark-Ingram, Marceia" <Marceia.A.Clark.Ingram@msfc.nasa.gov>
To: "Martin, Jolene" <Jolene.J.Martin@nasa.gov>,
"Glover, Steve" <Steve.E.Glover@nasa.gov>,
"Holmes, Steven G" <Steven.G.Holmes@nasa.gov>,
"Steve Newman (E-mail)" <snewman@mail.hq.nasa.gov>
Cc: "Clark-Ingram, Marceia" <Marceia.A.Clark.Ingram@msfc.nasa.gov>,
"Munafo, Paul" <Paul.M.Munafo@nasa.gov>
Subject: Request from NASA HQ
Date: Fri, 7 Feb 2003 14:25:00 -0600
X-Mailer: Internet Mail Service (5.5.2653.19)

Hi All,

I received a request today, from QE/Mr. Steve Newman of the Safety Mission Assurance Office at NASA Headquarters. Mr. Newman worked on operational environmental issues for Code M during the early 1990's. He is currently supporting Bryan O'Connor and leading a "Programmatic Assessment Team" for STS-107. This programmatic assessment team is focusing on the phase-out of blowing agents. Mr. Newman has requested information concerning the following:

- What is the name of the foam system on the Orbiter's bi-pod assembly?
- What is the blowing agent that is used in the foam system on the bi-pod assembly?
- What solvent is used to clean the metallic substrate under the foam system on the bi-pod assembly?
    - Is the solvent Methyl Ethyl Ketone (MEK) ?
- What is the process description for cleaning and foam application on bi-pod assembly? Are work instructions available?
- Is this a close-out foam and is it applied at MAF or KSC?

I am aware that the dissemination of information concerning STS-107 is very sensitive. Please provide guidance from (ET or SEA) concerning the appropriate communication flow for addressing this request. I provided Ms. Jolene Martin's phone number to Mr. Newman. I am more familiar with the acreage TPS on the ET and less familiar with foam on Orbiter, however, I will support the request per your direction. Additionally, Mr. Newman has contacted Ms. Amanda Goodson concerning this request.

Thanks,

ED36/Marceia Clark-Ingram
Materials Replacement Technology Team, Lead
256-544-6229
marceia.a.clark.ingram@msfc.nasa.gov

X-Authentication-Warning: spinoza.public.hq.nasa.gov: majordom set sender to owner-code-q using -f
X-Sender: prutledg@mail.hq.nasa.gov
X-Mailer: QUALCOMM Windows Eudora Version 4.3.2
Date: Tue, 04 Feb 2003 12:20:54 -0500
To: jlloyd@hq.nasa.gov
From: Pete Rutledge <prutledg@hq.nasa.gov>
Subject: Fwd: Questions/issues for Bryan's use
Cc: code-q@lists.hq.nasa.gov
Sender: owner-code-q@lists.hq.nasa.gov

Jim,

Attached is first batch of questions/issues for Bryan's use on the Columbia Accident Investigation Board. These are a combination of inputs from SMA Directors and from OSMA staff members; Pam Richardson is pulling them together and maintaining the list. We would propose that you send to Bryan daily--only the new questions/issues (to minimize e-mail download time on Bryan's end). They are numbered sequentially and in chronological order, so it will be easy to send just the new ones. By means of this e-mail, I'm sending the list of questions/issues to all OSMA staff members. As Ron Moyer suggested, seeing these questions/issues may prompt thoughts of new ones.

Suggest sending this batch to Bryan ASAP.

Thanks,

Pete

X-Sender: prichard@mail.hq.nasa.gov
X-Mailer: QUALCOMM Windows Eudora Version 4.3.2
Date: Tue, 04 Feb 2003 11:19:40 -0500
To: Pete.Rutledge@hq.nasa.gov
From: Pamela Richardson <prichard@hq.nasa.gov>
Subject:

~~~~~~

Pamela F. Richardson
Aerospace Technology Mission Assurance Manager
Enterprise Safety and Mission Assurance Division, Code QE
Office of Safety and Mission Assurance, NASA Headquarters
300 E. Street, S. W., Washington, DC 20546
phone: 202-358-4631, fax: 202-358-2778

~~~~~~

"The meek can *have* the Earth. The rest of us are going to the stars." --- Robert Heinlein
"We have to learn to manage information and its flow. If we don't, it will all end up in turbulence." --- RADM Grace Hopper

~~~~~~


questionsforbryan.doc

Peter J. Rutledge, Ph.D.
Director, Enterprise Safety and Mission Assurance Division
Acting Director, Review and Assessment Division
Office of Safety and Mission Assurance
NASA Headquarters, Code QE, Washington, DC 20546

ph: 202-358-0579
FAX:202-358-2778
e-mail: pete.rutledge@hq.nasa.gov

Mission Success Starts with Safety!
~~~~~~

X-Sender: prutledg@mail.hq.nasa.gov
X-Mailer: QUALCOMM Windows Eudora Version 4.3.2
Date: Mon, 03 Feb 2003 18:19:54 -0500
To: Mark Kowaleski <mkowales@hq.nasa.gov>
From: Pete Rutledge <prutledg@hq.nasa.gov>
Subject: Re: STS-107 OSMA data
Cc: alee@hq.nasa.gov, snewman@hq.nasa.gov

Art Lee should be giving you a copy of the OEP report (the draft as of Feb. 1 would be appropriate) on Michoud Assembly Facility from December and Steve Newman should give you IA on super lightweight tank. I'll let you know of anything else I run across.

Pete

At 09:55 AM 2/3/2003 -0500, you wrote:
Jim & Pete,

I gathered together all the STS-107 OSMA-related data that OSMA touched, saw, or responded to.

Jim: As requested, I will hand it over to you when I see you in person.

I asked Bill to provide copies of any email and launch day notes that he may have.
I'll add those to the binder when I get them.

Here is the outline of the two-voluem data set:

Mark

STS-107 OSMA mission related data products

1) Volume I, STS-107 OSMA Data
   a) Safety & Mission Assurance Report
      i) FRR version

ii) PMMT version
   b) Pre-flight Assessment Reviews (PFA)
      i) RSRM-88 PFA

ii) SRB - BI116 PFA (SR&QA Review)
iii) SSME PFA
iv) ET-93 PFA
   c) Preflight Assessment Review
      i) PAR-5 Minutes Topics (PAR Planning Notes from JSC)

(1) Jan 10, 2003

(2) Jan 17, 2003
(3) Jan 24, 2003
ii) Pre-Flight Assessment Review

iii) PFA - FRR Tag-up
iv) PFA - PMMT Tag-up
v) Range Safety Data Package

2) Volume II, STS-107 Email Exchange
a) Email Exchange
i) Email MER daily status reports

ii) Email OSF status messages to Code Q
iii) Email SR&QA Reports
iv) Email Inter-office (OSMA)
b) Launch Operations Data (on-console)
i) Interim Problem Reports (Pre-tanking report)

ii) ET Tanking Meeting SRB Special Topic
iii) PMMT (L-1) and Launch Day Notes (Kowaleski)
PMMT (L-1) and Launch Day Notes (Bihner)

Peter J. Rutledge, Ph.D.
Director, Enterprise Safety and Mission Assurance Division
Acting Director, Review and Assessment Division
Office of Safety and Mission Assurance
NASA Headquarters, Code QE, Washington, DC 20546

ph: 202-358-0579
FAX:202-358-2778
e-mail: pete.rutledge@hq.nasa.gov

Mission Success Starts with Safety!

From: "Munafo, Paul" <Paul.M.Munafo@nasa.gov>
To: "'J Steven Newman'" <snewman@hq.nasa.gov>
Subject: RE: Request from NASA HQ
Date: Fri, 21 Feb 2003 14:06:33 -0600
X-Mailer: Internet Mail Service (5.5.2653.19)

Yes, I do remember you, Steve. Wish we could have met again under less stressful conditions.

Paul

BTW, I'm finally catching up on my old E-mail.

-----Original Message-----
From: J Steven Newman [mailto:snewman@hq.nasa.gov]
Sent: Friday, February 07, 2003 3:28 PM
To: Clark-Ingram, Marceia
Cc: Martin, Jolene; Glover, Steve; Holmes, Steven G; Clark-Ingram, Marceia; Munafo, Paul; mkowales@hq.nasa.gov; prutledg@hq.nasa.gov; james Lloyd; Amanda.Goodson@msfc.nasa.gov
Subject: Re: Request from NASA HQ

Background/ Clarification to Marceia's Note:

Office of Safety & Mission Assurance (OSMA) Programmatic Independent Assessment Team - an ongoing OSMA activity, not specifically a 107 assessment activity. Paul Munafo will remember working together on the SLWT design verification, Q Independent Assessment in 1997.

This OSMA activity is currently pulling together background info related to ET 93 (see below) specifically to support NASA-wide SMA community, and AA/SMA Bryan O'Connor. I am also pulling together historic CFC/ODS Phase out info from 1990-1994 period during my tenure as Chief Environmental Engineer in the Office of Space Flight.

Please give me a call if you have any questions
Regards/Steve
202-358-1408

At 02:25 PM 2/7/2003 -0600, Clark-Ingram, Marceia wrote:

Hi All,

I received a request today, from QE/Mr. Steve Newman of the Safety Mission Assurance Office at NASA Headquarters. Mr. Newman worked on operational environmental issues for Code M during the early 1990's. He is currently supporting Bryan O'Connor and leading a "Programmatic Assessment Team" for STS-107. This programmatic assessment team is focusing on the phase-out of blowing agents. Mr. Newman has requested information concerning the following:

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I am aware that the dissemination of information concerning STS-107 is very sensitive. Please provide guidance from (ET or SEA) concerning the appropriate communication flow for addressing this request. I provided Ms. Jolene Martin's phone number to Mr. Newman. I am more familiar with the acreage TPS on the ET and less familiar with foam on Orbiter, however, I will support the request per your direction. Additionally, Mr. Newman has contacted Ms. Amanda Goodson concerning this request.

Thanks,

ED36/Marceia Clark-Ingram
Materials Replacement Technology Team, Lead
256-544-6229
marceia.a.clark.ingram@msfc.nasa.gov

James Lloyd, 05:04 PM 2/25/2003 -0500, Re: NSRS Mailbox checking...

To: James Lloyd <jlloyd@hq.nasa.gov>
From: Eric C Raynor <eraynor@hq.nasa.gov>
Subject: Re: NSRS Mailbox checking...
Cc: ebinns@futron.com, wharkins@hq.nasa.gov, jlemke <jlemke@hq.nasa.gov>
Bcc:
Attached:

Erin is checking, but I do not believe any contract change is required for them to check the box on a daily basis until further notice.

-Eric

At 03:23 PM 2/24/2003 -0500, you wrote:
In a meeting just this morning the Administrator wants to keep all lines of communication open that will allow anyone to convey information on STS 107 or other related flights of interest. There is to be an 888-703-CAIB hotline number to the CAIB, a web site where one can submit information to be announced tomorrow The IG piped up that he has a hot line and in the Enterprise Staff Meeting later this morning, Pete added that the NSRS is also an avenue. In view of that I would suggest that we keep the checking on a daily basis until further notice. Do we have to amend the contract to do this?

At 03:10 PM 2/24/2003 -0500, Eric C Raynor wrote:
John:

Erin has been checking the NSRS box daily since the loss of STS-107. Should she continue to do that, or should she revert back to the usual schedule of checking only Monday, Wednesday, and Friday? Please advise...

-Eric

Eric Raynor, Program Analyst
Code QS - Safety and Assurance Requirements Division
Office of Safety and Mission Assurance
NASA Headquarters, Washington, DC 20546

Phone: 202-358-4738
Fax: 202-358-3104
Email: eraynor@hq.nasa.gov

NSRS: http://www.hq.nasa.gov/nsrs
NSRS Intranet: http://nsrs-pbma-kms.intranets.com
LLIS: http://llis.nasa.gov
LLIS Intranet: http://llsc-pbma-kms.intranets.com
GIDEP: http://www.gidep.org

GIDEP Intranet: http://gidep-pbma-kms.intranets.com
SOLAR: https://solar.msfc.nasa.gov
Code Q Homepage: http://www.hq.nasa.gov/office/codeq

Jim

To: James Lloyd <jlloyd@hq.nasa.gov>
From: jlemke <jlemke@hq.nasa.gov>
Subject: Re: CAC
Cc:
Bcc:
Attached:

Jim:

Does Michael still want to exploit my wordsmithing skills and avail himself of my free "Sanity Checking Service?" I may be able to help attenuate the CACophony of passive voice, non-specific pronouns, and geek-speak.

At your command.

johnl

At 08:46 AM 2/4/2003 -0500, you wrote:
Dr. Greenfield is instituting a process for the collection of technical questions and answers and will serve as NASA's technical clearinghouse for release to the outside community. He will be providing details on how this information is to be collected and dispositioned. He has set up an action center (referred to as the CAC) and will chair a meeting each day at 2 pm (location to be provided shortly). Bill Bihner is the Code Q representative and will be attending the meeting starting this afternoon.

I have briefed Dr. Greenfield on our process for providing a list of questions to the CAIB. We will also be involved with supporting Bill Bihner and Dr. Greenfield in developing answers to technical questions where Code Q is the obvious source for the answer. We will also be allowed to review technical answers developed by others as part of the process for Dr. Greenfield's approval for release.

Jim

John Lemke
Manager, System Safety Engineering
NASA HQ, Code QS
202-358-0567 FAX 358-3104
jlemke@hq.nasa.gov
"Mission success stands on the foundation of our unwavering commitment to safety"
Administrator Sean O'Keefe January 2003

Jonathan B. Mullin, 08:46 AM 2/3/2003 -0500, Barksdale EOC Operations /Lufkin Communications Numbers

X-Sender: jmullin@mail.hq.nasa.gov
X-Mailer: QUALCOMM Windows Eudora Version 4.3.2
Date: Mon, 03 Feb 2003 08:46:11 -0500
To: jlloyd@hq.nasa.gov, whill@hq.nasa.gov
From: "Jonathan B. Mullin" <jmullin@hq.nasa.gov>
Subject: Barksdale EOC Operations /Lufkin Communications Numbers
Cc: boconnor@hq.nasa.gov, Wayne Kee <Wayne.Kee-1@ksc.nasa.gov>,
jpiaseck@hq.nasa.gov, michael.stevens-2@ksc.nasa.gov,
robert.t.gaffney1@jsc.nasa.gov, prutledg@hq.nasa.gov,
jlemke@hq.nasa.gov

Mr. Wayne Kee Emergency Preparedness Coordinator for the Kennedy Space Center is in place and operational at Barksdale Air Force Base. The Emergency Operations Center (EOC) work area to which he is assigned is Security and Emergency Services.

Barksdale EOC Numbers are (318) 456-7261/7259.
Mr. Wayne Kee

Lufkin Communications Center (this center is NASA operated) with the following numbers: **(936) 699-1017 or 1014/1015/1019.** NASA Code X informs Code Q that any NASA person deployed in that area can be contacted by calling the aforementioned numbers.

Regards, Jon

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"

X-Sender: jmullin@mail.hq.nasa.gov
X-Mailer: QUALCOMM Windows Eudora Version 4.3.2
Date: Sun, 02 Feb 2003 10:42:36 -0500
To: "David King" <Dking@mail.arc.nasa.gov>,
"Tom Ambrose" <Thomas.Ambrose@mail.dfrc.nasa.gov>,
"Manny Dominguez" <Manuel.B.Dominguez@lerc.nasa.gov>,
"Frank Robinson" <Frank.Robinson@grc.nasa.gov>,
"Teresa Spagnuolo" <Teresa.R.Spagnuolo.1@gsfc.nasa.gov>,
"Shawn Boesen" <Shawn.M.Boesen.1@gsfc.nasa.gov>,
"Les McGonigal" <Lester.A.McGonigal.1@gsfc.nasa.gov>,
"Terry Potterton" <Terry.M.Potterton.1@gsfc.nasa.gov>,
"John Griggs" <john.griggs@IVV.nasa.gov>,
"Annie O'Donoghue" <aodonogh@hq.nasa.gov>,
"Angela Stowes" <astowes@hq.nasa.gov>,
"Peter Robles" <Peter.Robles-Jr@jpl.nasa.gov>,
"Frank Mortelliti" <Frank.P.Mortelliti@jpl.nasa.gov>,
"Trish Smith-Araki" <Patricia.J.Smith-Araki@jpl.nasa.gov>,
"Brett Watterson" <John.B.Watterson@jpl.nasa.gov>,
"Ezra Abrahamy" <Ezra.R.Abrahamy@jpl.nasa.gov>,
"Don Hall" <dhall@wstf.nasa.gov>, "David Loyd" <dloyd@wstf.nasa.gov>,
"Bert Garrido" <Humberto.Garrido-1@ksc.nasa.gov>,
"Bill Barry" <William.Barry-1@kmail.ksc.nasa.gov>,
"Ron Gillett" <ronald.gillett-1@ksc.nasa.gov>,
"Steven Brisbin" <steven.brisbin-1@ksc.nasa.gov>,
"Burton Summerfield" <burton.summerfield-1@ksc.nasa.gov>,
"Calvert Staubus" <Calvert.Staubus-1@ksc.nasa.gov>,
"William Higgins" <William.Higgins-1@ksc.nasa.gov>,
"Bruce Jansen" <Bruce.Jansen-1@ksc.nasa.gov>,
"David Spacek" <David.J.Spacek@msfc.nasa.gov>,
"Dennis Davis" <Dennis.S.Davis@msfc.nasa.gov>,
"Stephen Turner" <Stephen.A.Turner@maf.nasa.gov>,
"Nick Cenci" <Nick.A.Cenci@ssc.nasa.gov>,
"Mike Rewis" <Mike.J.Rewis@ssc.nasa.gov>,
"Jim Lloyd" <jlloyd@hq.nasa.gov>, Raymond.J.Rubilotta.1@gsfc.nasa.gov,
stacey.t.nakamura@nasa.gov, bloewy@hq.nasa.gov,
G.M.Watson@larc.nasa.gov
From: "Jonathan B. Mullin" <jmullin@hq.nasa.gov>
Subject: Cancellation of Safety nd Health Managers' Meeting Cocoa Beach
Feb 3-7, 2003
Cc: thomas.marple@osha.gov, Eugene Hubbard <ehubbard@hq.nasa.gov>

You are advised that the NASA Safety and Heath Managers' Meeting has been postponed indefinitely. You should have been notified by the meeting registrations manager. If you have not been notified, please cancel your travel plans.

Regards, Jon

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"

X-Sender: jmullin@mail.hq.nasa.gov
X-Mailer: QUALCOMM Windows Eudora Version 4.3.2
Date: Sun, 02 Feb 2003 14:58:05 -0500
To: Wayne Kee <Wayne.Kee-1@ksc.nasa.gov>
From: "Jonathan B. Mullin" <jmullin@hq.nasa.gov>
Subject: Re: On Site at BAFB
Cc: jlemke@hq.nasa.gov, whill@hq.nasa.gov

Thanks, let us know what you need. Regards, Jon
At 05:19 PM 2/2/2003 +0000, you wrote:
> NASA KSC Emergency Preparedness and Security Team set up at Barksdale AFB, LA.

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: Sylvia Brookover <sbrookov@hq.nasa.gov>
From: Wilson Harkins <wharkins@hq.nasa.gov>
Subject: CAI Safety Reports (HATS Action QS/2003-00044)
Cc: rmoyer@mail.hq.nasa.gov
Bcc:
Attached: U:\users\wharkins\DATA\Columbia\Shuttle Safety Related Reports List.doc;

Sylvia,

Attached is a list of Shuttle related studies prepared as a part of the NASA Reliability and Maintainability Preferred Practices RTOP. These Best Practices now reside on the NASA Lessons Learned Information System at the URL indicated within the list. I'm not aware of any other Shuttle related information that I can assemble so I recommend that this action be closed. (If I do happen to find any additional information I will forward it regardless of the status of the Action Item. Let me know if you have any questions.

v/r

Wil

Name of Document: NASA Lesson Learned 0646 Power Line Filters (http://llis.gsfc.nasa.gov/)
Author(s) of Document: GSFC
Date (of Document): 1 Feb 1999
Brief Summary of Document: The absence of power line filters frequently results in cross interference, which disrupts the proper operation of hardware and can obliterate science data. These problems usually can be identified in ground testing; however, correcting them by retrofitting flight hardware is very difficult and expensive. Therefore, it is important that power line filters be included in the early design of hardware.
Bad News: N/A
Good News: N/A
NASA Response: N/A
Tough Questions and Answers: N/A

Name of Document: NASA Lesson Learned 0648 Use of Design Review Checklists for Space Shuttle Ground Support Equipment (GSE) (http://llis.gsfc.nasa.gov/)
Author(s) of Document: KSC
Date (of Document): 1 Feb 1999
Brief Summary of Document: Failure to use a checklist during the design phase could result in an R&M issue or consideration being overlooked. This could have an impact on the final reliability. Also, making reliability improvements later than the design phase, such as in the prototype or production phase, would result in a much greater increase in cost for the improvement than if the change were done earlier.
Bad News: N/A
Good News: N/A
NASA Response: N/A
Tough Questions and Answers: N/A

Name of Document: NASA Lesson Learned 0649 Identification, Control, and Management of Ground Support Equipment (GSE) Critical Items (http://llis.gsfc.nasa.gov/)
Author(s) of Document: KSC
Date (of Document): 1 Feb 1999
Brief Summary of Document: Identify potential critical items early in projects for Ground Support Equipment (GSE) as an input to hardware and software design activities. Perform Failure Modes and Effects Analysis (FMEA) for "as built" configuration GSE identifying Critical Items. Prepare Critical Items Lists (CIL's) and present the resulting risks to management for acceptance. Use CIL's to initiate control of the risks associated with the critical items and to request a waiver or deviation from program requirements.
Bad News: N/A
Good News: N/A
NASA Response: N/A
Tough Questions and Answers: N/A

Name of Document: NASA Lesson Learned 0653 Electrical Shielding of Power, Signal and Control Cables (http://llis.gsfc.nasa.gov/)
Author(s) of Document: GSFC
Date (of Document): 1 Feb 1999
Brief Summary of Document: All wiring harnesses, cables, and wires on payloads, instruments, subsystems, and components are well shielded, including the use of connector types that provide tight EMI back shells or other means for attaching shields. This practice assumes that all efforts have been made to develop a design which requires minimum shielding.
Bad News: N/A
Good News: N/A
NASA Response: N/A
Tough Questions and Answers: N/A

Name of Document: NASA Lesson Learned 0654 Assessment and Control of Electrical Charges (http://llis.gsfc.nasa.gov/)
Author(s) of Document: GSFC
Date (of Document): 1 Feb 1999
Brief Summary of Document: Adverse effects of electrostatic charges on space vehicle design, development, test and operation sometimes have been serious. Such effects include inadvertent ignition of electro-explosive devices, spurious triggering of electronics, and damage to insulating materials. The ignition, by electrostatic discharge, of the final stage solid rocket motor of the Delta launch vehicle for the Orbiting Solar Observatory spacecraft during test operations killed three men in 1964. Electrostatic discharges previously had ignited a similar motor without loss of life. In addition, failures of several vehicles after launch have been attributed to electrostatic discharges.
Bad News: N/A
Good News: N/A
NASA Response: N/A
Tough Questions and Answers: N/A

Name of Document: NASA Lesson Learned 0658 Electrical Grounding Practices for Aerospace Hardware (http://llis.gsfc.nasa.gov/)
Author(s) of Document: MSFC
Date (of Document): 1 Feb 1999
Brief Summary of Document: The impacts of failure to adhere to proven and acceptable grounding practices for the design and fabrication of electrical and electronic parts are: (1) potential damage to delicate space flight systems, subsystems, components and experiments; (2) creation of sparks or overheated components or connections, creating a fire hazard or a thermal imbalance that cannot be counteracted by environmental control systems; (3) danger to ground or flight crew personnel from electrical shock; or (4) damage to vehicle, payloads and ground systems due to atmospheric lightning. Ultimately, lack of proper grounding could cause death due to electrical shock or mission failure due to excessive heating, shorts, or fire.
Bad News: N/A
Good News: N/A
NASA Response: N/A
Tough Questions and Answers: N/A

Name of Document: NASA Lesson Learned 0659 Redundancy in Critical Mechanical Systems (http://llis.gsfc.nasa.gov/)
Author(s) of Document: KSC
Date (of Document): 1 Feb 1999
Brief Summary of Document: The careful use of redundancy in Critical Kennedy Space Center (KSC) Ground Support Equipment (GSE) Mechanical Systems ensures reliable operation.
Bad News: N/A
Good News: N/A
NASA Response: N/A
Tough Questions and Answers: N/A

Name of Document: NASA Lesson Learned 0661 Redundancy Considerations for Ground Communication Systems (http://llis.gsfc.nasa.gov/)
Author(s) of Document: KSC
Date (of Document): 1 Feb 1999
Brief Summary of Document: Designing a fail-safe ground communication system requires attention to hardware and policy decisions. Ensuring a fail-safe system normally requires some use of redundancy. It also requires safe operating procedures. It further requires a reliable source of power. This practice considers what operating procedures are needed, what level of hardware redundancy is required, and backup power considerations.
Bad News: N/A
Good News: N/A
NASA Response: N/A
Tough Questions and Answers: N/A

Name of Document: NASA Lesson Learned 0662 Uninterruptable Power Supply Systems (UPS) (http://llis.gsfc.nasa.gov/)
Author(s) of Document: KSC
Date (of Document): 1 Feb 1999
Brief Summary of Document: Enhance system, subsystem, and component reliability by providing an uninterruptable power supply (UPS) system.
Bad News: N/A
Good News: N/A
NASA Response: N/A
Tough Questions and Answers: N/A

Name of Document: NASA Lesson Learned 0663 Welding Practices for 2219 Aluminum and Inconel 718 (http://llis.gsfc.nasa.gov/)
Author(s) of Document: MSFC
Date (of Document): 1 Feb 1999
Brief Summary of Document: Gas Tungsten Arc Welding and Variable Polarity Plasma Arc Welding are preferred for joining 2219 Aluminum, and Electron Beam Welding is preferred for joining Inconel 718 in critical aerospace flight applications.
Bad News: N/A
Good News: N/A
NASA Response: N/A
Tough Questions and Answers: N/A

Name of Document: NASA Lesson Learned 0665 Oil-Free Vacuum Pumps in the LOX/LH2 Transfer System (http://llis.gsfc.nasa.gov/)
Author(s) of Document: KSC
Date (of Document): 1 Feb 1999
Brief Summary of Document: Oil-free pumping is the latest state of art in vacuum pump technology. At Kennedy Space Center, this technology is used to maintain approximate 650 sections of the LOX/LH2 vacuum jacketed transfer lines, at a pressure between 0-1000 Torr. This insures the capability to deliver cryogenic propellants on time and at a pre-defined temperature and pressure to the Shuttle vehicle. The use of oil-free pumps eliminates the risk of contaminating the LOX/LH2 transfer system (vacuum jacketed lines). It enhances the reliability of the vacuum pumping system.
Bad News: N/A
Good News: N/A
NASA Response: N/A
Tough Questions and Answers: N/A

Name of Document: NASA Lesson Learned 0666 Foreign Object Debris (FOD) Program at KSC (http://llis.gsfc.nasa.gov/)
Author(s) of Document: KSC
Date (of Document): 1 Feb 1999
Brief Summary of Document: Enhance the Reliability of Flight Hardware Processing Systems by including in the Program a reliable Foreign Object and Debris (FOD) policy and related procedures for use during launch and landing operations, vehicle and payload processing, and maintenance activities at designated areas of Kennedy Space Center (KSC) and off-site landing facilities under KSC responsibility.
Bad News: N/A
Good News: N/A
NASA Response: N/A
Tough Questions and Answers: N/A

Name of Document: NASA Lesson Learned 0669 Structural Laminate Composites for Space Applications (http://llis.gsfc.nasa.gov/)
Author(s) of Document: MSFC
Date (of Document): 1 Feb 1999
Brief Summary of Document: The creation of reliable structural laminate composites for space applications requires precision design and manufacturing using an integrated, concurrent engineering approach. Since the final material characteristics are established at the same time the part or subassembly is fabricated, part design, fabrication development, and material characterization must proceed concurrently. Because composite materials are custom-tailored to meet structural requirements of the assembly, stringent in-process controls are required to arrive at a configuration with optimum physical and material properties.
Bad News: N/A
Good News: N/A
NASA Response: N/A
Tough Questions and Answers: N/A

Name of Document: NASA Lesson Learned 0672 Application of Ablative Composites to Nozzles for Reusable Solid Rocket Motors (http://llis.gsfc.nasa.gov/)
Author(s) of Document: MSFC
Date (of Document): 1 Feb 1999
Brief Summary of Document: Fabrication of ablative composite materials for solid rocket motor nozzles requires a precision, integrated, multi-disciplinary, multivendor approach to design and manufacture. Creation of the material requires stringent process controls during manufacture of the rayon fiber, weaving the rayon fiber into cloth, carbonizing the rayon cloth, impregnation of carbon cloth with resin and filler, wrapping the carbon-phenolic onto a mandrel to the proper thickness, curing, nondestructive inspection and final machining to the designed configuration. Environmental conditions and cleanliness levels must be closely monitored when bonding the ablative material to the metal housing. The critical material properties for acceptance of carbon cloth-phenolic prepreg material are cloth content, dry resin solids content, volatile content, carbon filler content, and resin flow. Use of certified and highly skilled tape wrapping operators, bonding technicians, machinists, and destructive and nondestructive testing personnel, is a must.
Bad News: N/A
Good News: N/A
NASA Response: N/A
Tough Questions and Answers: N/A

Name of Document: NASA Lesson Learned 0682 Design and Manufacturing Guideline for Aerospace Composites (http://llis.gsfc.nasa.gov/)
Author(s): MSFC
Date (of Document): 1 Feb 1999
Brief Summary of Document: Conscientious adherence to proven concurrent engineering principles and careful design and material selection guidelines in the design, manufacture, and testing of aerospace composites will result in low rejection rates and high product integrity. Successful composite designs can provide design flexibility, lightweight parts, ease of fabrication and installation (generally fewer parts), corrosion resistance, impact resistance, high fatigue strength (compared to metal structures with the same dimensions), and product simplicity when compared to conventional fabricated metal structures.
Bad News: N/A
Good News: N/A
Tough Questions and Answers: N/A

Name of Document: NASA Lesson Learned 0685 Electrostatic Discharge Control in GSE (http://llis.gsfc.nasa.gov/)
Author(s) of Document: KSC
Date (of Document): 1 Feb 1999
Brief Summary of Document: Reducing the risk of Electrostatic Discharge (ESD) during Space Transportation Systems (STS) processing requires an understanding of the problems and proper reliability practices or controls for various conditions/situations. When conductive materials are present, proper bonding and grounding techniques are essential. When non-conductive materials (i.e., wood, paper, glass, plastics, etc.) are present, these materials must either be eliminated or properly selected or treated for the particular application and use. Another important factor in ESD control is the percent relative humidity (RH) which should be monitored and regulated/controlled, where feasible.
Bad News: N/A
Good News: N/A
NASA Response: N/A
Tough Questions and Answers: N/A

Name of Document: NASA Lesson Learned 0688 Management of Limited Failure Analysis Resources for Electrical, Electronic and Electromechanical (EEE) Parts (http://llis.gsfc.nasa.gov/)
Author(s) of Document: JSC
Date (of Document): 1 Feb 1999
Brief Summary of Document: This guideline provides a strategy for assessing part failure analysis as used in the Orbiter Program. This strategy has the benefit of a program that has redundant hardware/function, meets the fail operational-fail safe requirement, and can tolerate random failures and system maintenance while supporting its program goal.
Bad News: N/A
Good News: N/A
NASA Response: N/A
Tough Questions and Answers: N/A

Name of Document: NASA Lesson Learned 0695 Guidelines for Thermal Analysis of Spacecraft Hardware (http://llis.gsfc.nasa.gov/)
Author(s) of Document: GSFC
Date (of Document): 1 Feb 1999
Brief Summary of Document: This guideline describes the general criteria and methodology for the development of thermal models for predicting temperatures of spacecraft, instruments and other spaceflight hardware.
Bad News: N/A
Good News: N/A
NASA Response: N/A
Tough Questions and Answers: N/A

Name of Document: NASA Lesson Learned 0696 Spectral Fatigue Reliability (http://llis.gsfc.nasa.gov/)
Author(s) of Document: JSC
Date (of Document): 1 Feb 1999
Brief Summary of Document: A spectral (frequency domain) technique is used to estimate the design fatigue life and reliability of structural and mechanical components subject to randomly varying stress.
Bad News: N/A
Good News: N/A
NASA Response: N/A
Tough Questions and Answers: N/A

Name of Document: NASA Lesson Learned 0700 Fracture Mechanics Reliability (http://llis.gsfc.nasa.gov/)
Author(s) of Document: JSC
Date (of Document): 1 Feb 1999
Brief Summary of Document: Use a fracture mechanics formulation to estimate the design fatigue life and reliability of metallic or ceramic structural and mechanical components subject to fluctuating stress. For reusable spacecraft, update the reliability analysis based on in-service inspection and repair data.
Bad News: N/A
Good News: N/A
NASA Response: N/A
Tough Questions and Answers: N/A

Name of Document: NASA Lesson Learned 0701 Static Cryogenic Seals for Launch Vehicle Applications (http://llis.gsfc.nasa.gov/)
Author(s) of Document: MSFC
Date (of Document): 1 Feb 1999
Brief Summary of Document: Deflection actuated, pressure assisted coated metal seals, or spring energized Teflon® seals, along with prudent flange joint designs, should be used for high pressure static cryogenic sealing applications in launch vehicle engines and related propulsion system components.
Bad News: N/A
Good News: N/A
NASA Response: N/A
Tough Questions and Answers: N/A

Name of Document: NASA Lesson Learned 0710 EMC Guideline for Payloads, Subsystems, and Components (http://llis.gsfc.nasa.gov/)
Author(s) of Document: GSFC
Date (of Document): 1 Feb 1999
Brief Summary of Document: Guidance is provided for establishing design and test requirements for the control of electromagnetic emission and susceptibility characteristics of space hardware and payloads.
Bad News: N/A
Good News: N/A
NASA Response: N/A
Tough Questions and Answers: N/A

Name of Document: NASA Lesson Learned 0712 Design Considerations for Fluid Tubing Systems (http://llis.gsfc.nasa.gov/)
Author(s) of Document: JSC
Date (of Document): 1 Feb 1999
Brief Summary of Document: This delineates basic criteria for use in the design of fluid tubing systems for use on space flight equipment. These criteria are meant to enhance reliability and maintainability of these systems through standardized practices in design.
Bad News: N/A
Good News: N/A
NASA Response: N/A
Tough Questions and Answers: N/A

Name of Document: NASA Lesson Learned 0713 Vehicle Integration/Tolerance Buildup Practices (http://llis.gsfc.nasa.gov/)
Author(s) of Document: MSFC
Date (of Document): 1 Feb 1999
Brief Summary of Document: Use master gauges, tooling, jigs, and fixtures to transfer precise dimensions to ensure accurate mating of interfacing aerospace hardware. Calculate overall worst-case tolerances using the root sum square method of element tolerances when integrating multiple elements of aerospace hardware.
Bad News: N/A
Good News: N/A
NASA Response: N/A
Tough Questions and Answers: N/A

Name of Document: NASA Lesson Learned 0714 Battery Selection Practice for Aerospace Power Systems (http://llis.gsfc.nasa.gov/)
Author(s) of Document: MSFC
Date (of Document): 1 Feb 1999
Brief Summary of Document: When selecting batteries for space flight applications, the following requirements should be considered: ampere-hour capacity, rechargeability, depth of discharge (DOD), lifetime, temperature environments, ruggedness, and weight. Many batteries have been qualified and used for space flight, enhancing the ease of selecting the right battery.
Bad News: N/A
Good News: N/A
NASA Response: N/A
Tough Questions and Answers: N/A

Name of Document: NASA Lesson Learned 0721 Design Considerations for Space Trusses (http://llis.gsfc.nasa.gov/)
Author(s) of Document: GRC
Date (of Document): 1 Feb 1999
Brief Summary of Document: This practice can be used to determine an optimum truss configuration (e.g. minimum number of members) for a given loading condition and specified reliability. Probabilistic Structural Analysis Methods (PSAM) provides a formal and systematic way to evaluate structural performance reliability or risk at minimal time and low cost.
Bad News: N/A
Good News: N/A
NASA Response: N/A
Tough Questions and Answers: N/A

Name of Document: NASA Lesson Learned 0723 Independent Verification and Validation of Embedded Software (http://llis.gsfc.nasa.gov/)
Author(s) of Document: MSFC
Date (of Document): 1 Feb 1999
Brief Summary of Document: To produce high quality, reliable software, use Independent Verification and Validation (IV&V) in an independent, systematic evaluation process throughout the software life cycle. Using the IV&V process; locate, identify, and correct software problems and errors early in the development cycle.
Bad News: N/A
Good News: N/A
NASA Response: N/A
Tough Questions and Answers: N/A

Name of Document: NASA Lesson Learned 0734 Instrumentation System Design and Installation for Launch (http://llis.gsfc.nasa.gov/)
Author(s) of Document: MSFC
Date (of Document): 1 Feb 1999
Brief Summary of Document: Instrumentation systems and related sensors (transducers), particularly those designed for use in reusable and refurbishable launch systems and subsystems, are analyzed, designed, fabricated and tested with meticulous care in order to ensure system and subsystem reliability.
Bad News: N/A
Good News: N/A
NASA Response: N/A
Tough Questions and Answers: N/A

Name of Document: NASA Lesson Learned 0735 Material Selection Practices (http://llis.gsfc.nasa.gov/)
Author(s) of Document: MSFC
Date (of Document): 1 Feb 1999
Brief Summary of Document: Aerospace systems designers must ensure that the most reliable material is used to meet the design requirements for aerospace systems. Test results regarding corrosion resistance, susceptibility to stress corrosion cracking, flammability, toxicity, thermal vacuum stability, and compatibility with rocket engine fuels, oxidizers, and hydraulic fluids; as well as extensive chemical and physical properties data; are included in the Materials and Processes Technical Information System (MAPTIS). This information is used to assist the aerospace designer in identifying the most reliable material candidates for space systems.
Bad News: N/A
Good News: N/A
NASA Response: N/A
Tough Questions and Answers: N/A

Name of Document: NASA Lesson Learned 0737 Design Reliable Ceramic Components with CARES Code (http://llis.gsfc.nasa.gov/)
Author(s) of Document: GRC
Date (Of Document): 1 Feb 1999
Brief Summary of Document: Use the Ceramics Analysis and Reliability Evaluation of Structures (CARES) computer program to calculate the fast-fracture reliability or failure probability of macroscopically isotropic ceramic components.
Bad News: N/A
Good News: N/A
NASA Response: N/A
Tough Questions and Answers: N/A

Name of Document: NASA Lesson Learned 0738 Problem Reporting and Corrective Action System (http://llis.gsfc.nasa.gov/)
Author(s) of Document: KSC
Date (of Document): 1 Feb 1999
Brief Summary of Document: A closed-loop Problem (or Failure) Reporting and Corrective Action System (PRACAS or FRACAS) is implemented to obtain feedback about the operation of ground support equipment used for the manned spaceflight program.
Bad News: N/A
Good News: N/A
NASA Response: N/A
Tough Questions and Answers: N/A

Name of Document: NASA Lesson Learned 0739 Design Considerations for Lightning Strike Survivability (http://llis.gsfc.nasa.gov/)
Author(s) of Document: GRC
Date (of Document): 1 Feb 1999
Brief Summary of Document: Implement lightning survivability in the design of launch vehicles to avoid lightning induced failures.
Bad News: N/A
Good News: N/A
NASA Response: N/A
Tough Questions and Answers: N/A

Name of Document: NASA Lesson Learned 0750 High Performance Liquid Hydrogen Turbopumps (http://llis.gsfc.nasa.gov/)
Author(s) of Document: MSFC
Date (of Document): 1 Feb 1999
Brief Summary of Document: Understanding and addressing the design environment, component interactions, and potential failure modes are the keys to high reliability in high performance liquid hydrogen turbopumps for launch vehicle engines. Designing and using a combination of unique sealing, cooling, processing, material selection, and balancing techniques in response to engine design requirements will permit the development, production, and reliable flights of hydrogen turbopumps.
Bad News: N/A
Good News: N/A
NASA Response: N/A
Tough Questions and Answers: N/A

Name of Document: NASA Lesson Learned 0752 Check Valve Reliability in Aerospace Applications (http://llis.gsfc.nasa.gov/)
Author(s) of Document: MSFC
Date (of Document): 1 Feb 1999
Brief Summary of Document: In check valve design for aerospace applications examine all design features, materials, and tolerances to evaluate the effects of contamination and exposure to cryogenic or hypergolic propellants. Conduct long term compatibility tests simulating the operational environment to assess material suitability for each unique application.
Bad News: N/A
Good News: N/A
NASA Response: N/A
Tough Questions and Answers: N/A

Name of Document: NASA Lesson Learned 0756 Sneak Circuit Analysis Guideline for Electro-Mechanical Systems (http://llis.gsfc.nasa.gov/)
Author(s) of Document: MSFC
Date (of Document): 1 Feb 1999
Brief Summary of Document: Sneak circuit analysis should be used in safety critical systems to identify latent paths which cause the occurrence of unwanted functions or inhibit desired functions, assuming all components are functioning properly. It is based upon the analysis of engineering and manufacturing documentation. Because of the high cost of a sneak circuit analysis, it should be conducted only in areas where there is a high potential for a hazard.
Bad News: N/A
Good News: N/A
NASA Response: N/A
Tough Questions and Answers: N/A

Name of Document: NASA Lesson Learned 0757 The Team Approach to Fault-Tree Analysis (http://llis.gsfc.nasa.gov/)
Author(s) of Document: MSFC
Date (of Document): 1 Feb 1999
Brief Summary of Document: Use a multi-disciplinary approach to investigations using fault-tree analysis for complex systems to derive maximum benefit from fault-tree methodology. Adhere to proven principles in the scheduling, generation, and recording of fault-tree analysis results.
Bad News: N/A
Good News: N/A
NASA Response: N/A
Tough Questions and Answers: N/A

Name of Document: NASA Lesson Learned 0758 Computational Fluid Dynamics (CFD) in Launch Vehicle Applications (http://llis.gsfc.nasa.gov/)
Author(s) of Document: MSFC
Date (of Document): 1 Feb 1999
Brief Summary of Document: Use high-speed, computer-based computational fluid dynamics analytical techniques, verified by test programs to establish propulsion and launch vehicle hardware designs for optimum performance and high reliability. These procedures will validate designs and provide an early assurance of operational viability.
Bad News: N/A
Good News: N/A
NASA Response: N/A
Tough Questions and Answers: N/A

Name of Document: NASA Lesson Learned 0759 Solid Rocket Motor Joint Reliability (http://llis.gsfc.nasa.gov/)
Author(s) of Document: MSFC
Date (of Document): 1 Feb 1999
Brief Summary of Document: Critical design features that reduce joint rotation, improve seal features, provide close tolerances, provide for leak checks, and provide venting are used to improve the reliability of case-to-case and case-to-nozzle field joints for large solid propellant rocket motors. Principal design drivers are the combustion chamber pressure vs. time profile, segment stacking and assembly tolerances, insulation and sealing configurations, launch dynamic loads, flight dynamic loads, and environmental temperatures.
Bad News: N/A
Good News: N/A
NASA Response: N/A
Tough Questions and Answers: N/A

Name of Document: NASA Lesson Learned 0760 Eddy Current Testing of Aerospace Materials (http://llis.gsfc.nasa.gov/)
Author(s) of Document: MSFC
Date (of Document): 1 Feb 1999
Brief Summary of Document: Eddy Current Testing (ECT) can be used on electrically conductive material for detecting and characterizing defects such as surface and near surface cracks, gouges, and voids. It can also be used to verify a material's heat treat condition. In addition, wall thickness of thin wall tubing, and thickness of conductive and nonconductive coating on materials can be determined using ECT.
Bad News: N/A
Good News: N/A
NASA Response: N/A
Tough Questions and Answers: N/A

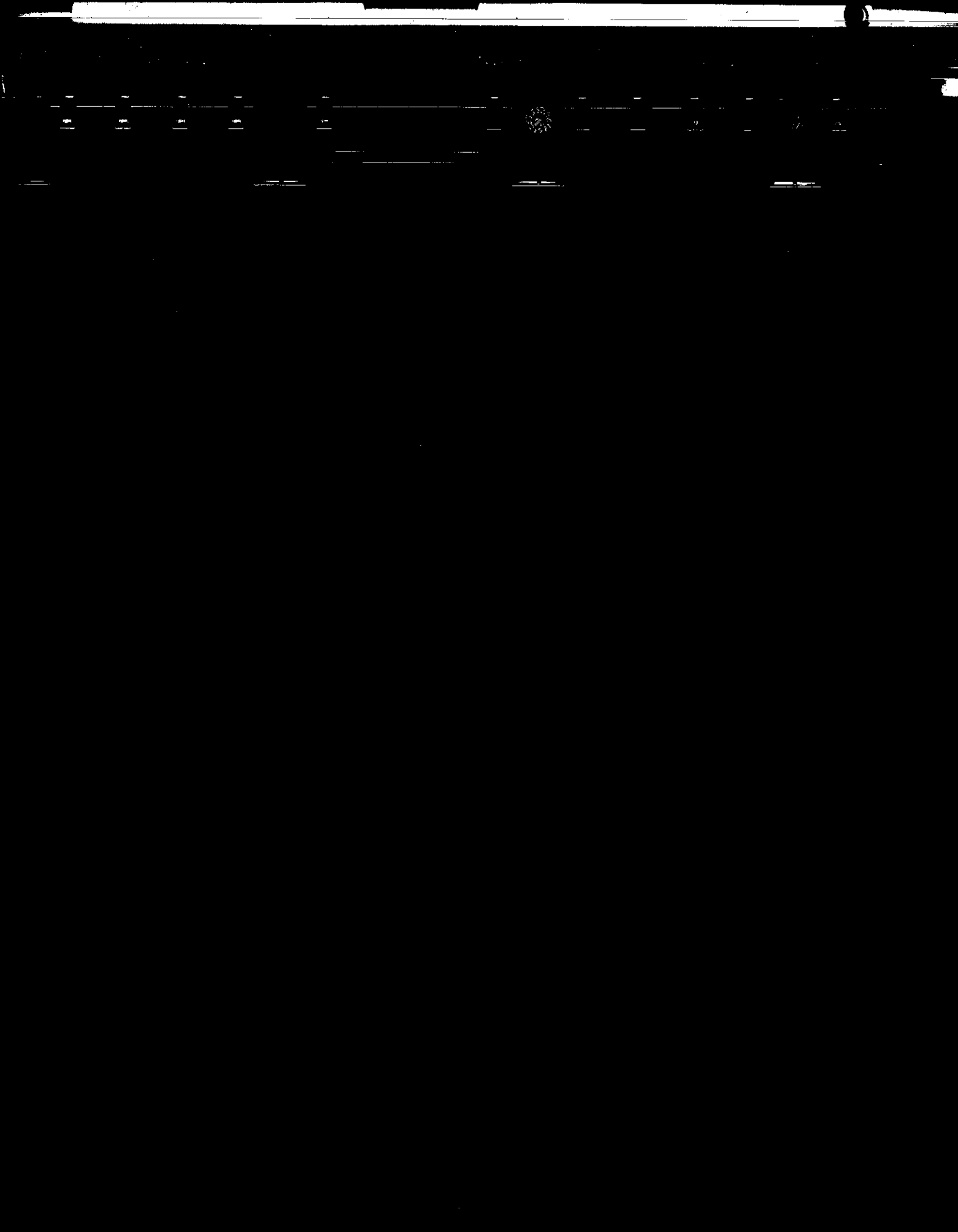
Name of Document: NASA Lesson Learned 0761 Guideline for Developing Reliable Instrumentation for Aerospace Systems (http://llis.gsfc.nasa.gov/)
Author(s) of Document: MSFC
Date (of Document): 1 Feb 1999
Brief Summary of Document: The development of in-flight instrumentation, vehicle health management systems, and sensor systems for control and monitoring should be thoroughly integrated into the requirements generation, preliminary design, and early planning for payloads and space flight systems. Multi-disciplinary Product Development Teams (PDTs) must include instrumentation considerations at the very front end of the development process. This will allow maximum advantage to be gained from current and emerging technologies to provide both real time and postflight diagnostics that will reliably and consistently reflect the system's condition. The result will be improved vehicle and payload system reliability through accurate and well-planned access to performance information. Emphasis must be placed on early definition of instrumentation and measurement requirements to reduce the time and cost to develop reliable instrumentation systems and ensure mission success.
Bad News: N/A
Good News: N/A
NASA Response: N/A
Tough Questions and Answers: N/A

Name of Document: NASA Lesson Learned 0762 Systems Design Analysis Applied to Launch Vehicle Configurations (http://llis.gsfc.nasa.gov/)
Author(s) of Document: MSFC
Date (of Document): 1 Feb 1999
Brief Summary of Document: Use design management improvements such as matrix methods, quality techniques, and life cycle cost analyses in a systematic approach to systems analysis.
Bad News: N/A
Good News: N/A
NASA Response: N/A
Tough Questions and Answers: N/A

Name of Document: NASA Lesson Learned 0763 Systems Test Considerations for High Performance Liquid Propellant Rocket Engines (http://llis.gsfc.nasa.gov/)
Author(s) of Document: MSFC
Date (of Document): 1 Feb 1999
Brief Summary of Document: To achieve high overall liquid rocket fueled propulsion system reliability, conduct a comprehensive test program that verifies and validates the liquid rocket engine's operation as it interacts and interfaces with other elements of the propulsion system, (i.e., structures, propellant feed systems, propellant tankage, and control electronics).
Bad News: N/A
Good News: N/A
NASA Response: N/A
Tough Questions and Answers: N/A

Name of Document: NASA Lesson Learned 0764 Controlling Stress Corrosion Cracking in Aerospace Applications (http://llis.gsfc.nasa.gov/)
Author(s) of Document: MSFC
Date (of Document): 1 Feb 1999
Brief Summary of Document: This practice presents considerations that should be evaluated and applied concerning stress corrosion and subsequent crack propagation in mechanical devices, structural devices, and related components used in aerospace applications. Material selection, heat treat methods, fabrication methodology, testing regimes, and loading path assessments are presented as methods to reduce the potential for stress corrosion cracking in a material's operational environment.
Bad News: N/A
Good News: N/A
NASA Response: N/A
Tough Questions and Answers: N/A

Name of Document: NASA Lesson Learned 0765 Ultrasonic Testing of Aerospace Materials (http://llis.gsfc.nasa.gov/)
Author(s) of Document: MSFC
Date (of Document): 1 Feb 1999
Brief Summary of Document: Three general methods of ultrasonic testing can be used singly or in combination with each other to identify cracks, debonds, voids, or inclusions in aerospace materials. Each has its own unique application and all require certain precautions or techniques to identify potentially flawed hardware. This practice describes selected principles that are essential in reliable ultrasonic testing.
Bad News: N/A
Good News: N/A
NASA Response: N/A
Tough Questions and Answers: N/A



Name of Document: NASA Lesson Learned 0766 Reliability Considerations for Launch Vehicle Command Destruct Systems (http://llis.gsfc.nasa.gov/)
Author(s) of Document: MSFC
Date (of Document): 1 Feb 1999
Brief Summary of Document: Use built-in redundancies, safe and arm provisions, approved and qualified initiators and detonators, shaped charge development testing to collect empirical data for design (empirical testing), and fail-safe designs to achieve reliability in launch vehicle command destruct systems.
Bad News: N/A
Good News: N/A
NASA Response: N/A
Tough Questions and Answers: N/A

Name of Document: NASA Lesson Learned 0801Advanced Computed X-Ray Tomography (http://llis.gsfc.nasa.gov/)
Author(s) of Document: MSFC
Date (of Document): 1 Feb 1999
Brief Summary of Document: Use advanced computed X-ray tomography as a precision method of materials characterization and defect location to ensure high reliability of aerospace hardware and conformance to design requirements. Employ this sophisticated and proven technology for nondestructive evaluation (NDE) of materials and structures. Assure the adherence to established precautionary measures during tomography operations.
Bad News: N/A
Good News: N/A
NASA Response: N/A
Tough Questions and Answers: N/A

Name of Document: NASA Lesson Learned 0802 Battery Verification Through Long Term Simulations (http://llis.gsfc.nasa.gov/)
Author(s): MSFC
Date (of Document): 1 Feb 1999
Brief Summary of Document: Conduct highly instrumented real-time long term tests and accelerated testing of space flight batteries using automated systems that simulate prelaunch, launch, mission, and post mission environments to verify suitability for the mission, to confirm the acceptability of design configurations, to resolve mission anomalies, and to improve reliability.
Bad News: N/A
Good News: N/A
NASA Response: N/A
Tough Questions and Answers: N/A

Name of Document: NASA Lesson Learned 0803 Identification, Control, and Management of Critical Items Lists (http://llis.gsfc.nasa.gov/)
Author(s) of Document: MSFC
Date (of Document): 1 Feb 1999
Brief Summary of Document: Initiate the preparation of Critical Items Lists (CILs) early in programs to identify and potentially eliminate critical items before the design is frozen and as an input to hardware and software design, testing, and inspection planning activities. Utilize CILs during the operational portion of the life cycle to manage failures and ensure mission success.
Bad News: N/A
Good News: N/A
NASA Response: N/A
Tough Questions and Answers: N/A

Name of Document: NASA Lesson Learned 0805 Practice of Reporting Parts, Materials, and Safety Problems (Alerts) (http://llis.gsfc.nasa.gov/)
Author(s) of Document: MSFC
Date (of Document): 1 Feb 1999
Brief Summary of Document: Ensure that potentially significant problems involving parts, materials, and safety discovered during receiving inspection, manufacturing, post-manufacturing inspection, or testing do not affect the safety or the performance of NASA hardware by reporting all anomalies via ALERT systems. ALERTS and SAFE ALERTS pertaining to these problems are quickly disseminated for impact assessment and, if required, corrective action taken or a rationale developed for "flying as is."
Bad News: N/A
Good News: N/A
NASA Response: N/A
Tough Questions and Answers: N/A

Name of Document: NASA Lesson Learned 0806 Rocket Engine Technology Test Bed Practice (http://llis.gsfc.nasa.gov/)
Author(s) of Document: MSFC
Date (of Document): 1 Feb 1999
Brief Summary of Document: Conduct highly instrumented tests of O2/H2rocket engine systems to: (1) evaluate and verify new propulsion technologies; (2) validate or modify analytical models; (3) more fully understand the operation of rocket engine systems under varying performance conditions, and (4) ensure engine reliability and operability.
Bad News: N/A
Good News: N/A
NASA Response: N/A
Tough Questions and Answers: N/A

Name of Document: NASA Lesson Learned 0807 Penetrant Testing of Aerospace Materials (http://llis.gsfc.nasa.gov/)
Author(s) of Document: MSFC
Date (of Document): 1 Feb 1999
Brief Summary of Document: Penetrant testing improves hardware reliability by detecting surface flaws and defects in solid materials and structures. The discontinuities must be open to the material surface.
Bad News: N/A
Good News: N/A
NASA Response: N/A
Tough Questions and Answers: N/A

Name of Document: NASA Lesson Learned 0808 Magnetic Particle Testing of Aerospace Materials (http://llis.gsfc.nasa.gov/)
Author(s) of Document: MSFC
Date (of Document): 1 Feb 1999
Brief Summary of Document: Magnetic Particle Testing can be used on all ferromagnetic materials to locate surface and subsurface discontinuities such as cracks, laps, seams, and inclusions.
Bad News: N/A
Good News: N/A
NASA Response: N/A
Tough Questions and Answers: N/A

Name of Document: NASA Lesson Learned 0811 Radiographic Testing of Aerospace Materials (http://llis.gsfc.nasa.gov/)
Author(s) of Document: MSFC
Date (of Document): 1 Feb 1999
Brief Summary of Document: Radiographic testing can be used as a nondestructive method for detecting internal defects in thick and complex shapes in metallic and nonmetallic materials, structures, and assemblies.
Bad News: N/A
Good News: N/A
NASA Response: N/A
Tough Questions and Answers: N/A

Name of Document: NASA Lesson Learned 0812 Leak Testing of Liquid Hydrogen and Liquid Oxygen Propellant Systems (http://llis.gsfc.nasa.gov/)
Author(s) of Document: MSFC
Date (of Document): 1 Feb 1999
Brief Summary of Document: Leak testing is a nondestructive test method that provides the capability to detect and measure the amount of liquid or gas escaping from a sealed pressure system and to locate the individual leaks for possible repair.
Bad News: N/A
Good News: N/A
NASA Response: N/A
Tough Questions and Answers: N/A

Name of Document: NASA Lesson Learned 0815 Flight Loads Analysis as a Spacecraft Design Tool (http://llis.gsfc.nasa.gov/)
Author(s) of Document: GSFC
Date (of Document): 1 Feb 1999
Brief Summary of Document: The determination of accurate spacecraft loads via coupled flight loads analysis is used throughout the entire spacecraft development cycle, from conceptual design to final verification loads calculations.
Bad News: N/A
Good News: N/A
NASA Response: N/A
Tough Questions and Answers: N/A

Name of Document: NASA Lesson Learned 0816 Design of an Improved Gas Transfer Valve for Leak Tight Testing (http://llis.gsfc.nasa.gov/)
Author(s) of Document: JSC
Date (of Document): 1 Feb 1999
Brief Summary of Document: A needle-point penetration gas transfer valve has been developed at JSC that is leak tight and gives very reliable results in transferring low or high pressure gases from sample containers to laboratory measuring devices such as chromatographs.
Bad News: N/A
Good News: N/A
NASA Response: N/A
Tough Questions and Answers: N/A

Name of Document: NASA Lesson Learned 0817 Vibroacoustic Qualification Testing of Payloads, Subsystems, and Components (http://llis.gsfc.nasa.gov/)
Author(s) of Document: GSFC
Date (of Document): 1 Feb 1999
Brief Summary of Document: Perform acoustic and random vibration testing supplemented with additional sine vibration testing as appropriate to qualify payload hardware to the vibroacoustic environments of the mission, particularly the launch environment and to demonstrate acceptable workmanship.
Bad News: N/A
Good News: N/A
NASA Response: N/A
Tough Questions and Answers: N/A

Name of Document: NASA Lesson Learned 0820 Global Positioning System (GPS) Timing System (http://llis.gsfc.nasa.gov/)
Author(s) of Document: KSC
Date (of Document): 1 Feb 1999
Brief Summary of Document: Use of the Global Positioning System (GPS) to provide a timing system with improved reliability and accuracy over the previous system.
Bad News: N/A
Good News: N/A
NASA Response: N/A
Tough Questions and Answers: N/A

Name of Document: NASA Lesson Learned 0821 Automatic Transfer Switches (ATS) in Critical Applications (http://llis.gsfc.nasa.gov/)
Author(s) of Document: KSC
Date (of Document): 1 Feb 1999
Brief Summary of Document: This practice provides proven techniques for enhancing the reliability of Automatic Transfer Switches (ATS) used in critical applications. Systems which require the use of ATS may be optimized for fail-safe operation using worst-case design techniques and good maintainability/preventive maintenance practices. The probability of internal ATS failures which could result in loss of power to the load can be minimized by giving particular attention to the ATS transfer methods, power-switch types used, and regular attention to the health of the equipment.
Bad News: N/A
Good News: N/A
NASA Response: N/A
Tough Questions and Answers: N/A

Name of Document: NASA Lesson Learned 0822 Design of a Small Apparatus for Improved Vibration/Thermal Testing (http://llis.gsfc.nasa.gov/)
Author(s): JSC
Date (of Document): 1 Feb 1999
Brief Summary of Document: A small test fixture has been specifically designed for conducting vibration/thermal tests on small test specimens such as ignitors and detonators. This test fixture creates much smaller loads and less hostile thermal environments for the vibrator table armature thus creating a more reliable test set up. In addition, this small test fixture provides much more rapid and accurate thermal transfer to a test specimen which results in more data points for the same test times and more accuracy and reliability in the test data.
Bad News: N/A
Good News: N/A
NASA Response: N/A
Tough Questions and Answers: N/A

Name of Document: NASA Lesson Learned 0823 Modal Testing: Measuring Dynamic Structural Characteristics (http://llis.gsfc.nasa.gov/)
Author(s): JSC
Date (of Document): 1 Feb 1999
Brief Summary of Document: Modal testing is a structural testing practice that provides low levels of mechanical excitation to a test structure and measures its response to that excitation. This response is then analyzed to experimentally determine the dynamic structural characteristics of the test subject. Modal testing may be performed on all suitable space structures including those associated with the Orbiter and the Space Station.
Bad News: N/A
Good News: N/A
NASA Response: N/A
Tough Questions and Answers: N/A

Name of Document: NASA Lesson Learned 0824 Space Radiation Effects on Electronic Components in Low-Earth Orbit (http://llis.gsfc.nasa.gov/)
Author(s) of Document: JSC
Date (of Document): 1 Feb 1999
Brief Summary of Document: During system design, choose electronic components/devices which will provide maximum failure tolerance from Space Radiation Effects. The information above provides guidance in selection of radiation hardened (rad-hard) solid state devices and microcircuits for use in space vehicles which operate in low-earth orbits.
Bad News: N/A
Good News: N/A
NASA Response: N/A
Tough Questions and Answers: N/A

Name of Document: NASA Lesson Learned 0825 System Reliability Assessment Using Block Diagraming Methods (http://llis.gsfc.nasa.gov/)
Author(s) of Document: JSC
Date (of Document): 1 Feb 1999
Brief Summary of Document: Use reliability predictions derived from block diagram analyses during the design phase of the hardware development life cycle to analyze design reliability; perform sensitivity analyses; investigate design trade-offs; verify compliance with system-level requirements; and make design and operations decisions based on reliability analysis outputs, ground rules, and assumptions.
Bad News: N/A
Good News: N/A
NASA Response: N/A
Tough Questions and Answers: N/A

Name of Document: NASA Lesson Learned 0826 Manned Space Vehicle Battery Safety (http://llis.gsfc.nasa.gov/)
Author(s) of Document: JSC
Date (of Document): 1 Feb 1999
Brief Summary of Document: This practice is for use by designers of battery-operated equipment flown on space vehicles. It provides such people with information on the design of battery-operated equipment to result in a design which is safe. Safe, in this practice, means safe for ground personnel and crew to handle and use; safe for use in the enclosed environment of a manned space vehicle and safe to be mounted in adjacent un-pressurized spaces.
Bad News: N/A
Good News: N/A
NASA Response: N/A
Tough Questions and Answers: N/A

Name of Document: NASA Lesson Learned 0830 Rocket Engine Failure Prediction Using an Average Signal Power Technique (http://llis.gsfc.nasa.gov/)
Author(s) of Document: GRC
Date (of Document): 1 Dec 1994
Brief Summary of Document: Apply a univariate failure prediction algorithm using a signal processing technique to rocket engine test firing data to provide an early failure indication. The predictive maintenance technique involves tracking the variations in the average signal power over time.
Bad News: N/A
Good News: N/A
NASA Response: N/A
Tough Questions and Answers: N/A

Name of Document: NASA Lesson Learned 0831 Maintainability Program Management Considerations (http://llis.gsfc.nasa.gov/)
Author(s) of Document: HQ
Date (of Document): 1 Dec 1994
Brief Summary of Document: Identify program management considerations necessary when implementing maintainability principles for NASA space flight, atmospheric, or ground support programs.
Bad News: N/A
Good News: N/A
NASA Response: N/A
Tough Questions and Answers: N/A

Name of Document: NASA Lesson Learned 0832 Robotic Removal and Application of SRB Thermal Systems (http://llis.gsfc.nasa.gov/)
Author(s) of Document: MSFC
Date (of Document): 1 Dec 1994
Brief Summary of Document: When designing robotic systems for removal and application of thermal protection materials, pay close attention to support fixture indexing, precision positioning, optimum sequencing, and protection against robotic cell environmental conditions. By integrating proven hardware and software practices with equipment and facility design and operation, the effectiveness of robotic systems is ensured.
Bad News: N/A
Good News: N/A
NASA Response: N/A
Tough Questions and Answers: N/A

Name of Document: NASA Lesson Learned 0833 Neutral Buoyancy Simulation of On-Orbit Maintenance (http://llis.gsfc.nasa.gov/)
Author(s) of Document: MSFC
Date (of Document): 1 Dec 1994
Brief Summary of Document: Simulate on-orbit space maintenance activities by using a neutral buoyancy facility to assist in making design decisions that will ensure optimum on-orbit maintainability of space hardware.
Bad News: N/A
Good News: N/A
NASA Response: N/A
Tough Questions and Answers: N/A

Name of Document: NASA Lesson Learned 0834 Maintainability Considerations in Extravehicular Activities (EVA) Design: An Astronauts Perspective (http://llis.gsfc.nasa.gov/)
Author(s) of Document: JSC
Date (of Document): 1 Dec 1994
Brief Summary of Document: Extravehicular Activities (EVAs) are very demanding and specialized space flight activities. With the substantial costs from any unsuccessful EVA and the limited opportunities for work-arounds, careful maintainability design of payloads/systems and their operations are essential for complete mission success.
Bad News: N/A
Good News: N/A
NASA Response: N/A
Tough Questions and Answers: N/A

Name of Document: NASA Lesson Learned 0835 Benefits of Implementing Maintainability on NASA Programs (http://llis.gsfc.nasa.gov/)
Author(s) of Document: JSC
Date (of Document): 1 Dec 1994
Brief Summary of Document: Programmatic provisions for ease of maintenance greatly enhance hardware and software system operational effectiveness for both in-space and ground support systems.
Bad News: N/A
Good News: N/A
NASA Response: N/A
Tough Questions and Answers: N/A

Name of Document: NASA Lesson Learned 0836 Solid Rocket Booster (SRB) Refurbishment Practices (http://llis.gsfc.nasa.gov/)
Author(s) of Document: MSFC
Date (of Document): 1 Dec 1994
Brief Summary of Document: Engage in refurbishment activities to rebuild and prepare for reuse of the Solid Rocket Boosters (SRB's) after each Space Shuttle Orbiter launch. These refurbishment activities include: (1) inspection, (2) reworking of anomalies to specification, (3) material review board (MRB) acceptance or scrapping, (4) cleaning, (5) corrosion protection and prevention, (6) scheduled part replacement, (7) test and checkout, and (8) preparation for storage or return to flight buildup.
Bad News: N/A
Good News: N/A
NASA Response: N/A
Tough Questions and Answers: N/A

Name of Document: NASA Lesson Learned 0837 False Alarm Mitigation Techniques (http://llis.gsfc.nasa.gov/)
Author(s) of Document: JSC
Date (of Document): 1 Dec 1994
Brief Summary of Document: Minimize the occurrence and effect of Built In Test (BIT) false alarms by applying principles and techniques that are intended to reduce the probability of false alarms and increase the reliability of BIT in avionics and other electronic equipment.
Bad News: N/A
Good News: N/A
NASA Response: N/A
Tough Questions and Answers: N/A

Name of Document: NASA Lesson Learned 0845 Vibration Analysis of Rotating Ground Support Machinery (http://llis.gsfc.nasa.gov/)
Author(s) of Document: KSC
Date (of Document): 1 Dec 1994
Brief Summary of Document: Use the noise or vibration created by mechanical equipment to determine the actual condition of the equipment. Vibration analysis can be used as a nondestructive method for detecting incipient problems in rotating machinery such as imbalance, misalignment, and damaged or worn components and thereby prevent catastrophic failures from occurring. Vibration analysis also can be used for determining what maintenance actions are necessary for a piece of rotating machinery and the frequency of those actions.
Bad News: N/A
Good News: N/A
NASA Response: N/A
Tough Questions and Answers: N/A

Name of Document: NASA Lesson Learned 0848 Maintenance and Test Criteria for Circuit Breakers (http://llis.gsfc.nasa.gov/)
Author(s) of Document: KSC
Date (of Document): 1 Dec 1994
Brief Summary of Document: Enhance the Ground Support Equipment (GSE) and Facility Equipment Maintenance Program by adoption of a maintenance practice that provides maintenance and test criteria for electrical circuit breakers.
Bad News: N/A
Good News: N/A
NASA Response: N/A
Tough Questions and Answers: N/A

Name of Document: NASA Lesson Learned 0850 Electrical Connector Protection (http://llis.gsfc.nasa.gov/)
Author(s) of Document: KSC
Date (of Document): 1 Dec 1994
Brief Summary of Document: Protect the receptacles/plug ends of demated electrical connections with covers provided by manufacturer or with generic plastic caps or if covers are unavailable, leave in downward facing position.
Bad News: N/A
Good News: N/A
NASA Response: N/A
Tough Questions and Answers: N/A

Name of Document: NASA Lesson Learned 0851 GHe Purging of Hydrogen Systems (http://llis.gsfc.nasa.gov/)
Author(s) of Document: KSC
Date (of Document): 1 Dec 1994
Brief Summary of Document: Prior to venting a hydrogen (H2) system, initiate a gaseous helium (GHe) sweep purge to evacuate air from the vent line. After venting operations are complete, initiate a second GHe sweep purge to evacuate the vent system of residual H2. Use a flapper valve or check valve on the vent line to prevent air intrusion into the line during low or intermittent flow conditions.
Bad News: N/A
Good News: N/A
NASA Response: N/A
Tough Questions and Answers: N/A

Name of Document: NASA Lesson Learned 0852 Programmable Logic Controllers (http://llis.gsfc.nasa.gov/)
Author(s): KSC
Date (of Document): 1 Dec 1994
Brief Summary of Document: Use solid state Programmable Logic Controllers (PLC's) in system/equipment design to control and monitor systems and processes.
Bad News: N/A
Good News: N/A
NASA Response: N/A
Tough Questions and Answers: N/A

Name of Document: NASA Lesson Learned 0854 Pneumatic Systems - Pilot-Controlled Pressure Regulator Loading (http://llis.gsfc.nasa.gov/)
Author(s) of Document: KSC
Date (of Document): 1 Dec 1994
Brief Summary of Document: Use a separate, hand-operated, spring-loaded, vented regulator in pneumatic system designs to provide reference pressures for pilot controlled pressure regulators. Specify application in system/equipment specifications, requirements documents, and design policies and practices.
Bad News: N/A
Good News: N/A
NASA Response: N/A
Tough Questions and Answers: N/A

Name of Document: NASA Lesson Learned 0855 Pneumatic System Contamination Protection (http://llis.gsfc.nasa.gov/)
Author(s) of Document: KSC
Date (of Document): 1 Dec 1994
Brief Summary of Document: Install filters immediately upstream of all interfaces in pneumatic systems to control dirt and water contamination.
Bad News: N/A
Good News: N/A
NASA Response: N/A
Tough Questions and Answers: N/A

Name of Document: NASA Lesson Learned 0867 Use of GN (http://llis.gsfc.nasa.gov/)
Author(s) of Document: KSC
Date (of Document): 22 May 2000
Brief Summary of Document: GN2 is provided to the actuator breather of pneumatically actuated valves used in hostile environments (salt spray, high humidity, SRB exhaust).
Bad News: N/A
Good News: N/A
NASA Response: N/A
Tough Questions and Answers: N/A

Name of Document: NASA Lesson Learned 0878 Orbiter S-Band Uplink Monitoring System (http://llis.gsfc.nasa.gov/)
Author(s) of Document: KSC
Date (of Document): 1 Dec 1994
Brief Summary of Document: The S-Band Uplink Monitoring System provides the means to verify the voice and data communications received by the Orbiter while at the launch pad are complete and error-free.
Bad News: N/A
Good News: N/A
NASA Response: N/A
Tough Questions and Answers: N/A

Name of Document: NASA Lesson Learned 0880 AC – Variable Frequency Drive Systems (http://llis.gsfc.nasa.gov/)
Author(s) of Document: KSC
Date (of Document): 1 Dec 1994
Brief Summary of Document: During the design of new or modifications to existing systems requiring motor speed control, consider the use of alternating current (AC) variable frequency drive systems for motor control.
Bad News: N/A
Good News: N/A
NASA Response: N/A
Tough Questions and Answers: N/A

Name of Document: NASA Lesson Learned 0881 Fiber Optic Systems (http://llis.gsfc.nasa.gov/)
Author(s) of Document: KSC
Date (of Document): 1 Dec 1994
Brief Summary of Document: During new design or upgrades to existing transmission systems, consider the use of fiber optic systems in place of metallic cable systems.
Bad News: N/A
Good News: N/A
NASA Response: N/A
Tough Questions and Answers: N/A

Name of Document: NASA Lesson Learned 0883 Facility Chilled Water for Thermal Conditioning Unit (TCU) (http://llis.gsfc.nasa.gov/)
Author(s) of Document: KSC
Date (of Document): 1 Dec 1994
Brief Summary of Document: Use of the Facility Chilled Water (FCW) System to provide the heat exchange medium for the hypergolic propellant Thermal Conditioning Units (TCU).
Bad News: N/A
Good News: N/A
NASA Response: N/A
Tough Questions and Answers: N/A

Name of Document: NASA Lesson Learned 0890 High Performance Liquid Oxygen Turbopumps (http://llis.gsfc.nasa.gov/)
Author(s) of Document: MSFC
Date (of Document): 1 Dec 1994
Brief Summary of Document: Unique cooling, sealing, draining, and purging methods, along with precision interference fits and vibration damping methods are used in high performance liquid oxygen turbopumps. Coatings and dry lubricants are used to provide protection against cracking, fretting, and generation of contamination. Silicon nitride bearings resist wear and provide long life.
Bad News: N/A
Good News: N/A
NASA Response: N/A
Tough Questions and Answers: N/A

Name of Document: NASA Lesson Learned 0891 Preventative Maintenance Strategies Using Reliability Centered Maintenance (RCM) (http://llis.gsfc.nasa.gov/)
Author(s) of Document: JSC
Date (of Document): 1 Dec 1994
Brief Summary of Document: RCM is the best approach to developing the preventive maintenance program for a new system. It provides a step-by-step approach, prioritizes preventive maintenance tasks, and optimizes the repair cost.
Bad News: N/A
Good News: N/A
NASA Response: N/A
Tough Questions and Answers: N/A