Independent of NASA for Administrator Level boards.
- Standing Interagency board of senior personnel
  - Specific Shuttle systems and operations,
  - Policies with supporting sub teams with expertise in
    - On call Rapid Response team trained in agency investigation
  - Special Space Shuttle contingency boards.

Special Considerations - Contingency Planning
David Whitlee

September 18, 2002

Contingency Plans

NASA Space Shuttle
Improve The System
Improve Mission Supportability
Meet The Manifest
Fly Safely

Goals:

Space Shuttle Program Overview
Mission Success Starts With Safety
8 DoD missions
7 ISS utilization/logistics cargos
5 spacecraft repaired and/or serviced
17 spacecraft retrieved/returned
8 major ISS element deployables

(retrievable and also shown in retrievable payloads category)
25 scientific/technology deployable platforms (some
3 planetary deployables
1 commercial deployable (25 before Challenger)
40 scientific platforms (stay attached to shuttle)

Shuttle Activity Since Challenger

Mission Success Starts With Safety

NASA
Shuttle Components

External Tank (1)

Solid Rocket Boosters (2)

ET

SRB:

Engines

Located in the OMS Pods

For Large Orbital Adjust Burns

Small Engines (2)

OMS Engines

NASA
Major Incident in the Vehicle Assembly Building (VAB)
- Major Incident in the Orbiter Processing Facility (OPF)
- Incident while mounted on Shuttle Carrier Aircraft (SCA)
- Crash landing at landing site
- Major vehicle malfunction during entry
- Major vehicle malfunction on orbit
- Major vehicle malfunction during ascent
- Return to launch site (RTLS)
- Contingency abort
- Transonic abort (TAL)
- Major malfunction on launch pad

These situations may present themselves in a variety of ways some of which represent loss of mission, others loss of vehicle and crew.

NASA has in place the plans, training, and the independent review processes to address contingency and catastrophic situations.

Preparedness
Specialized Operations Contingency
Mission Success Starts With Safety
For Special Flight Operations
Activation of Agency Contingency Action Plan
Mission Success Starts With Safety
Locate witnesses and obtain initial statements, names, and addresses.
Document the original state of the evidence.
Secure the site and control access.
Initial Accident Investigation Board. Their primary responsibilities are to:
- The MIT travels to the incident site on a rapid response aircraft and they are the
  or an Aircraft Mishap Investigation Course.

(Note: All of the above must have attended either the Shuttle Crash Investigation
Photographer
Ground Operations Manager
-- Main propulsion system engineer
-- Administrative manager
-- Safety representative
-- Flight representative
-- Payload representative
-- DMS * Representative

The team consists of the following personnel:

A trained, rapid response team that the Space Shuttle Program may deploy to any

"Mishap Investigation Team (MIT) aka "go team"
Mission Success Starts With Safety
as required and is reviewed, at a minimum, prior to each mission.

Office of Space Flight Programs contingency-related information is updated periodically and distributed to HQ OSF managers, as required.

Office of Space Flight Programs contingency notification lists are updated.

Crew recovery team, are in place prior to each mission.

Members of the mishap investigation team, the Rapid Response team, and the contact and to maintain a listing of working group chairpersons.

Field centers are required to provide an updated list of single points of

To maintain currency.

Top-Level OSF Program contingency policy documents are revised regularly.

Shuttle Program managers in addressing specific contingency situations.

Schedule approximately every 18 months to provide training to space contingencies simulation exercises have been performed in the past and are.

Mishaps:

Flight (OSF) maintains its readiness to handle any OSF-related program.

The following actions have been taken to ensure that the Office of Space

Preparedness

Mission Success Starts With Safety
may obtain technical support from government or non-government sources on an as needed basis.

NOTE: The NASA Administrator will select the Board chair from the names in 1-6 above. The Board

Headquarters, Washington, DC

Executive Secretary: NASA Chief Engineer, Mr. Theron M. Bradley Jr. (NASA)

Assurance, Mr. Bryan O'Connor (NASA Headquarters, Washington, DC)

Ex-officio member: NASA Associate Administrator, Office of Safety and Mission

or non-mission-related

7. NASA Field Center Director or NASA Program Associate Administrator (non-OSF

AFB, CA)


AFB, CA)

5. DOT Chief of Aviation Safety Division, Dr. James N. Hallcock (Cambridge, MA)

4. Commander, Naval Safety Center, Rear Adm. Stephen Turcotte (Norfolk, VA)


2. FAA Director of Accident Investigation, Mr. Steve B. Wallace (Washington, DC)

1. USAF Chief of Safety, Maj. Gen. Ken W. Hess (Kirtland AFB, NM)

Membership is as follows:

Headquarters, OSF Field Centers, and technical consultants as required. Board

The board consists of seven members, supported by the Office of Space Flight (OSF)

Standing Mismatch Interagency Investigation Board

Mission Success Starts With Safety
and security.

expertise in areas such as public affairs, legal, medical, safety,
action plan. This includes staff advisors as required for
tracilities as provided in the office of space flight contingency
field centers contingency support plans, and supporting
established NASA support structure of working groups, NASA
The conduct of this investigation will be done using the
precedence over all other duties
The investigation board duties of each board member will take

Board Operating Guidelines

Mission Success Starts With Safety
Interagency Mishap Investigation Board?

Any questions on the Shuttle MIT and
Learned:

- Provides maximum "cross fertilization" through lessons learned.
- Recomendations.
- Provides closed-loop tracking system to implement policy and guideline.
- Ensures an unbiased, independent, and thorough investigation.

Process and return to flight to support agency mission objectives.

NASA needs quick and thorough investigation to ensure safety of NASP non-punitive system.

Methodology:
- Recurrence using structured and proven investigation.
- Identity root cause and contributing factors to prevent mishap.

Summary

Mission Success Starts with Safety
Status/level of membership ensures credibility.

Administrator-level needs

Separate independent, interagency board.

Investigation.

Capability to perform all analyses required to complete the

Trained and experienced professionals.

Capability and competencies:

Summary (continued and completed)
Back-Up Slides
Mission Success Starts With Safety

Time of Main Engine Failure

Abort Capability for Single Engine Out

Abort Capability for Single Engine Out

Our trajectory is designed such that we always have the capability (performance) to successfully complete at least one of the aborts. This is true even if one of the SSME's has failed.
Witness Statements

Mission Success Starts With Safety

NASA

Witness Statements:

• NASA recognizes that the ultimate decision on release of statements or information in a NASA mishap investigation involves privacy considerations.

• NASA may also withhold other information in a NASA mishap investigation report from release, depending on such factors as whether such information is classified, privileged, or non-releasable.

• Witness statements given in the course of a NASA mishap investigation are privileged and non-releasable.

Basic NASA Mishap Investigation Policy/Philosophy Regarding

Witnesses and Their Statements:

Report may reside in a court or administrative body outside NASA.
Mishap Investigation (computer-based training)

- Human Factors in Mishap Investigation (3 days)
- MORT Refresher (3 days)
- Shuttle Accident Investigation (5 days)

Witness interviewing and more

- Covers MORT, barrier analysis, cause effect analyses,
- Management Oversight and Risk Tree (5 days)

Investigators:

- NASA offers the following training to potential NASA investigation
- NASA personnel have training and experience in accident

Investigation Training

Mission Success Starts With Safety
sources or from non-Government sources, such as consultants. Observers may be obtained from these same Government agencies. Observers may be solicited from NASA, or other members of the investigative Board. Board members must not have any vested interest in the outcome.

Mission

An unexpected or unanticipated event under investigation which is appointed to investigate a NASA Mission Investigation Board. A NASA-sponsored board.

NASA Mission Investigation Board

Expected or unexpected failures in which the damage was criteria are included, as are test failures in which the damage was expected. Damage resulting in damage.

Type A Mission - A Mission causing death and/or damage to equipment or property equal to or greater than 5 million. Mission failure providing that a written agreement or operational control and corrective action responsibility.

NAS AG Operation - ANY unplanned occurrence or event resulting from any NASA operation, involving specialized equipment anomaly, involving loss of.

Key Definitions

Mission Success Starts With Safety
conformance with NASA policy.

Accept the NASA mishap investigation report as complete and in
appropriate official, the official with the final responsibility to review and
Approving Official: The official with the final responsibility to review and
accept the CAP, track and close corrective actions, and produce a
summary report of mishap-related activities upon completion.

Accept the CAP, track and close corrective actions, and produce a
responsible organization to develop a Corrective Action Plan (CAP),
also authorized to accept the final mishap investigation report, direct the
close call, or to accept the investigation of another authority. This official is
investigative, or technical investigation team to investigate a mishap at
Investigation board, mishap investigator, medical board, center-level
investigation board, mishap investigator, medical investigator, and the Associate
investigator, or technical investigation team to investigate a mishap at
Investigation board, mishap investigator, medical board, center-level
investigation board, mishap investigator, medical investigator, and the Associate

Approving Official. The official authorized to appoint the mishap

mission operations report or equivalent document.

achievement of primary NASA mission objectives as described in the
administrator for safety and mission assurance, prevents the
Administrator of the Enterprise, Associate administrator, and the Associate
Administrator of the Enterprise, Associate administrator, and the Associate

Mission Failure: A mishap of whatever intrinsic severity that, in the

Key Definitions

Mission Success Starts With Safety
preventing, minimizing, or limiting the potential for recurrence of a mishap.

- Corrective Actions. Changes to design processes, work instructions,
  drawings, tools, equipment, facilities, resources, or material that result in
  workmanship practices, training, inspections, tests, procedures, specifications,
  and changes to design processes, work instructions.

- Recommendations. May be used in the preparation of the corrective action plan.
  The cause or deficiency identified during the investigation. The
  investigating authority.

- Findings. A conclusion based on facts established during the investigation by the
  investigating authority.

- Significant Observations. A factor, event, or circumstance identified during the
  investigation that did not contribute to the mishap or close call, but if left
  uncorrected has the potential to cause a mishap, injury, or increase the severity
  of the mishap.

---

Key Definitions

Mission Success Starts With Safety
the mishap or close call.

or indirectly, to the dominant root cause, or which contributed to the severity of

**Contributing Root Cause**. A factor, event, or circumstance which led, directly

Policy/practice/procedure.

...systemically either by policy/practice/procedure or individual adherence to

cell, the first causal action or failure to act that could have been controlled

dominant root cause. Along a chain of events leading to a mishap or close

future mishaps or close calls prevented.

mishaps or close calls. Once identified, the conditions can be corrected and

Identifying the basic factors, reasons, and causes for conditions that result in

Root Cause Analysis. The root cause analysis is a structured process for

---

**Key Definitions**

Mission Success Starts With Safety

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NASA
Back Up Information

Training Courses

Mishap Investigation

Mission Success Starts With Safety

NASA
- Mishap Investigation Board Chairperson
- Aircraft Mishap Investigation
- Space Shuttle Crash Investigation
- Human Factors in Mishap Investigation
- Investigation and Refresher
- Management Oversight and Risk Tree Based Mishap

NASA Mishap Investigation Training

Mission Success Starts With Safety
Individually investigating lesser mishaps
members of boards of investigation, but is also easily adapted for use by
press is sufficient for investigation of major type A and B mishaps by
reinforced by practical examples and exercises. The information
(MORT) approach to accident investigation. Lecture and theory are
analytical techniques based on the Management Oversight and Risk Tree
collection are discussed, the focus of the course is on the application of
condisely. While the basics of mishap investigation and evidence
investigations and to report the results of those investigations clearly and
the analytical tools and techniques to conduct effective and efficient.
The purpose of this workshop is to provide the student the knowledge and

Course Length - 5 Days

NSTC 006, MORT-Based Mishap Investigation
Mission Success Starts With Safety
Mort-based Mishap Investigation Course.

Students participating in this course should have previously taken a Mort.

Students will be sharpened through classroom training and student group exercises.

They will be briefly reviewed, and proficiency in the application of commonly used analytical tools, including Mort, will be strengthened.

In the application of common knowledge, writing the report – will be reviewed. The report – initial response, collecting and interpreting evidence, managing procedures, and requirements. The practical aspects of investigation and

update the student knowledge of NASA mishap investigation policies.

The Mort-based Mishap Investigation Refresher course is provided to

Course Length - 2 Days

Mort-based Mishap Investigation Refresher

Nasa

Mission Success Starts With Safety
During class on scenarios based on actual NASA mishaps, techniques and a modified MORF diagram will be presented and used of MORF will be expanded using concepts from other analytical human factors and MORF concepts. The human error analysis aspects human factors contribution. The course provides an overview of basic analysis tool (modified) for an in-depth analysis of mishaps to identify Management Oversight and Risk Tree (MORT) and/or the Incident aspects of mishap causation and also advocate the use of the human factor contributions to mishaps. It will discuss the human error and

Course Length - 3 Days

NSTC 012, Human Factors in Mishap Investigation

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To aviation accidents, contains extensive accident investigation information generally applicable crashes and references SSP MIB documents and guidelines, but also addressing the news media. The course is focused on Space Shuttle 1970, 1030, bloodborne pathogen requirements and NASA requirements on sessions on field investigation, course content also addresses OSHA witness interviewing and site mapping are key areas discussed during identification, recovery and protection, medical issues, photography, identification boards organization and field techniques, evidence qualification. Topics discussed include: fast response requirements, investigator Shuttle. This course provides instruction in aviation accident investigation basics.

Course Length - 4 Days

NSTC 018, Space Shuttle Crash Investigation

NASA Mission Success Starts With Safety
aircraft mishaps in teaching the dos and don’ts of field investigation.

The course instructor uses practical examples and discussion of actual laboratory methods is included for familiarization, but not covered in depth.

Topics of discussion include pre-mishap preparation, witness interviewing, capture of as much evidence as possible in a minimum amount of time.

This course provides Field Investigation and Management Techniques for

Course Length - 3 Days

NSTD 019, Aircraft Mishap Investigation

Mission Success Starts With Safety
Mishap Investigation will be included. Principles and practices of use to any type of the application of commonly used analytical tools, including MRT, managing an investigation, writing the report – will be reviewed, and leading/managing a board. The practical aspects of investigation policies, procedures, and requirements as they relate to update the students' knowledge of NASA mishap investigation.

The Mishap Investigation Board Chairperson course is provided to

Course Length - 1 Day

NTC 024, Mishap Investigation Board Chairperson

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Mission Success Starts With Safety

Gibert White

Faith, maybe you know how to get in touch with Victor?

FYI

Subject: STS-107 Hazardous Material List
From: Gibert White <gwhite@nasa.gov>
To: ProjectOH-FOOO.gov, Faith Chandler <fcchandler@nasa.gov>
Date: Sun, 02 Feb 2003 18:30:16 -0600

You may reach me by the cell phone number if you require any assistance.

I will be in the SMA action room today.

SMA is gathering the FMEA's and Fault Trees for the Payloads.

Call Victor with the information.

Here is the information that you requested.

McC-02-03.doc:
Attached: C:\documents and settings\handley\documents\tech\STS-107 Hazards

Subject: Fwd: STS-107 Hazardous Material List
From: Faith Chandler <fcchandler@nasa.gov>
To: Mary E. Kicza <mkicza@mail.hq.nasa.gov>

MARY E. KICZA, 07:14 AM 2/3/2003 05:00, FWD: STS-107 Hazardous Material List
Chromosome protein suite

Chromotrophe (d)
Chromomere (e)
Chromophorion
Chromosome
Chromatin
Chromatophore
celldetoxine
Genetic:
tetramethylammonium
Genome
Nucleosome
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<table>
<thead>
<tr>
<th>Compound</th>
<th>Description</th>
<th>Concentration</th>
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<tbody>
<tr>
<td>Hygromycin</td>
<td>Inhibitor HNAP (C1109-1100Na2)</td>
<td></td>
</tr>
<tr>
<td>Insulin from bovine pancreas</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lactase (L)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>L-aspartic acid-2-phosphate</td>
<td></td>
<td></td>
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<tr>
<td>L-ascorbic acid-3-phosphate</td>
<td></td>
<td></td>
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<tr>
<td>L-glutamic acid, monosodium salt</td>
<td></td>
<td></td>
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<tr>
<td>Lithium aluminium tetraoxide</td>
<td></td>
<td></td>
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<tr>
<td>L-lysine (Well 28)</td>
<td></td>
<td></td>
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<tr>
<td>Magnesium carbonate</td>
<td></td>
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<tr>
<td>Magnesium chloride</td>
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<tr>
<td>Manganese chloride</td>
<td></td>
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<tr>
<td>Maltose (Well 9)</td>
<td></td>
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<tr>
<td>Methylisochromalin</td>
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<td></td>
</tr>
<tr>
<td>Methyl-d-glucoside</td>
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<td></td>
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<tr>
<td>Methylene sodium bisulfate</td>
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<tr>
<td>Methyl-dimethylphosphine oxide</td>
<td></td>
<td></td>
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<tr>
<td>Niacin</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Nicotinamide</td>
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<tr>
<td>Novobiocin (Well 13)</td>
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</tr>
<tr>
<td>Octyl-1-glucoside (half slide surface)</td>
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<td></td>
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<tr>
<td>Ornithine (Well 30)</td>
<td></td>
<td></td>
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<tr>
<td>Oxazin (1-0 um)</td>
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<tr>
<td>Paracetamol</td>
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<td>Pencillin G (Well 21)</td>
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<tr>
<td>Polyethylene glycol 400</td>
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<td></td>
</tr>
<tr>
<td>Polyethylene glycol 6000</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Polyvinyl B (Well 1)</td>
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</tbody>
</table>
Attitude control system will be overwhelmed and unable to compensate. Perhaps some of the flight control logic is already triggering into rundown simulations to determine if the loss or something else is occurring.

Illustration...

The flight control system authority to safely maintain attitude and control will be compromised.

To flight safety...

The analysis and belief that this mission (and potential damage) did not represent a threat some months without consuming a problem. Undoubtedly this previous experience is a factor in the decision. But many have come to realize that some very significant damage to the airplane is possible due to a high enough to represent a structural problem. However, these results measured at various locations (wheels, etc.) were not inconsistent with the structural integrity of the airplane.

In summary, BRIEGES Ron D. mentioned that during re-entry the Orbiter Flight Control System

Attached:

From: John P. Castellano <castellano@nasa.gov>
Subject: Support to RLV
To: Pete Rutledge <prutledge@nasa.gov>

Pete Rutledge, 08:31 Pm 2/4/2003 0600, Support to RLV
X-Sender:
Date: Sun, 2 Feb 2003 16:04:14 -0800
To: Michael Stamatelatos <mstamate@hq.nasa.gov>
From: 
Subject: Re: Report

Michael:
I will have hat report and the publications that came from it FEDExed to you tomorrow.
Best,

A while ago, you wrote a report for NASA on the safety of the shuttle tiles. I do not know its exact title. We cannot find a copy of the report here at HQ. Therefore, I am asking you to send me a copy ASAP if possible.
I apologize for this urgent request.
I hope everything is well with you.
We are certainly having our work cut for us for the time being and for the near future.
Thanks, again,
Best regards,
Michael

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"

****************************

Stanford University, Stanford CA 94305-4026 USA

ятирд for Michael Stamatelatos <Michael.G.Stamatelatos@nas...
Please Note: I do not systematically read email on weekends, when I am out of town, nor generally more than once a day otherwise. Please call if it is urgent.
X-Sender: sneman@mail.hq.nasa.gov
X-Mailer: QUALCOMM Windows Eudora Version 4.3.2
Date: Mon, 03 Feb 2003 16:49:46 -0500
To: mwetherh@hq.nasa.gov, fchandle@hq.nasa.gov, mstamate@hq.nasa.gov, mkowales@hq.nasa.gov, lsirota@hq.nasa.gov, dlengyel@mail.hq.nasa.gov, henry.hartt@baesystems.com, dvecellio@arescorporation.com, jcastell@hq.nasa.gov, swander@hq.nasa.gov, tom.whitmeyer@hq.nasa.gov
From: J Steven Newman <sneman@hq.nasa.gov>
Subject: Fwd: NAVY CONDOLENCES ON THE LOSS OF COLUMBIA AND HER CREW
Cc: boconnor@hq.nasa.gov, jlloyd@hq.nasa.gov, prutledg@hq.nasa.gov

Q/ NNBE Colleagues/ Team

Please find attached heartfelt condolences from our extended family at NAVSEA.

With Shared Sympathies
Regards/Steve

From: Ford Alfred H NSSC <FordAH@NAVSEA.NAVY.MIL>
To: "Newman, Steve" <sneman@hq.nasa.gov>
Cc: Angus Hendrick <HendrickAG@NAVSEA.NAVY.MIL>,
Anthony Mullarky
<MullarkyAJ@NAVSEA.NAVY.MIL>,
Brian Hughitt <HughittBK@NAVSEA.NAVY.MIL>,
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Printed for Michael Stamatelatos <Michael.G.Stamatelatos@nas...>
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  Jim Thompson <ThompsonJN@NAVSEA.NAVY.MIL>,
  John Lambert <LambertJD@NAVSEA.NAVY.MIL>,
  John Leadmon <LeadmonJT@NAVSEA.NAVY.MIL>,
  Kerry Frink <FrinkKD@NAVSEA.NAVY.MIL>,
  L Baker <BakerLR@NAVSEA.NAVY.MIL>,
  Marion Hall <HallMB@NAVSEA.NAVY.MIL>,
  Michael Slipper <SlipperME@NAVSEA.NAVY.MIL>,
  Neal Zarin <ZarinNM@NAVSEA.NAVY.MIL>,
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Thomas Van Petten <VanPettenTL@NAVSEA.NAVY.MIL>
Subject: NAVY CONDOLENCES ON THE LOSS OF COLUMBIA AND HER CREW
Date: Mon, 3 Feb 2003 15:07:19 -0500
X-Mailer: Internet Mail Service (5.5.2653.19)

COLUMBIA.pdf
3 February, 2003

Dr. Steven J. Newman
Office of Safety and Mission Assurance
National Aeronautics and Space Administration
Washington, DC 20546-0001

Dear Steve,

On behalf of all the Navy members of the NASA/Navy Benchmarking Exchange effort, I want to express the deep personal sadness we feel upon learning of the loss of the Space Shuttle COLUMBIA and her crew. Our heartfelt sympathies go out to the NASA family at this very difficult time. The Navy team members recognize what a rare privilege we have to be working with NASA. The NASA personnel we have encountered are some of the most competent, dedicated and remarkable people we have ever met. Please extend our condolences to all the fine people we have worked with at NASA Headquarters, Johnson Space Center, Kennedy Space Center and the other Centers across the country. We grieve with you, we stand by you, and we look forward to a continued relationship focused on helping one another.

Sincerely,

[Signature]
Alfred H. Ford, Jr.
Submarine Safety & Quality Assurance
Naval Sea Systems Command
NNBE Navy Team Lead
For your information: Senate is adjourned today in honor of the seven astronauts.

[Attached: Senate Resolution 41 commemorate.doc]

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

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

Jim
Jim,

We had already anticipated the need for the report. Couldn’t find it here. I asked Michael S. to call her. Should arrive today via FedEx. I hope our call didn’t cause her to give a press conference!!

Pete

At 10:26 AM 2/4/2003 -0500, James Lloyd wrote:
I recall seeing the study and recall it being on workmanship and its relationship to goodness of tile application. The study also treats the risk in a probabilistic sense. Maybe Bill Loewy could do a search on the web if it might be available externally or on the servers if internally. I think it predates Bob Weinstock but I may be wrong unless it was worked through Vitro. I would bet it is somewhere where we might have all the supporting documents for risk assessment.

At 09:58 AM 2/4/2003 -0500, Wayne R. Frazier wrote:
Jack Mannix from legal just called me. They are looking for a 1990 study by Elizabeth Pate-Cornell at Stanford on Shuttle Risk Analysis. I think I remember Bob Weinstock working that from here out of Code Q5 funds. Does anyone have a copy. Apparently its getting some press.

Wayne

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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"
Jim

Peter J. Rutledge, Ph.D.
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Mission Success Starts with Safety!