



March 15, 2010

Vice Admiral Joseph W. Dyer, USN (Ret.)
Chairman
Aerospace Safety Advisory Panel
National Aeronautics and Space Administration
Washington, DC 20546

Joe
Dear Admiral Dyer:

Enclosed is NASA's response to recommendation 2008-02-01 from the 2008 Second Quarterly Meeting of the Aerospace Safety Advisory Panel (ASAP), and follow-up responses to previously addressed recommendations requested by the ASAP. Please do not hesitate to contact me if the Panel would like further background on the information provided in the enclosures.

I look forward to receiving continued advice from the ASAP that results from your important fact-finding and quarterly meetings.

Sincerely,

A handwritten signature in black ink, appearing to read "C. Bolden, Jr.", written over the word "Sincerely,".

Charles F. Bolden, Jr.
Administrator

6 Enclosures:

1. NASA Response to 2008-02-01 NSC Participation in Standards
2. NASA Follow-up Response to 2008-01-05 NSRS Benchmarking
3. NASA Follow-up Response to 2008-02-07 Accident Review Timeliness
4. NASA Follow-up Response to 2008-02-08 Fall Protection Standard
5. NASA Follow-up Response to 2008-03-02 Industrial Safety Metrics
6. NASA Follow-up Response to 2008-03-05 Open CAIB Recommendations

Tracking Number 2008-02-01
NASA Safety Center Participation in Standards

Recommendation

The ASAP recommended that the NASA Safety Center (NSC) be included in the NASA process for evaluating whether new standards are needed and the decision on whether to implement those standards.

NASA Response

The NASA policy for the development, maintenance, and adoption of standards is NASA Policy Directive 8070.6, Technical Standards. The process for the development, maintenance, and adoption of NASA Technical Standards is divided into those developed by the Office of the Chief Engineer (OCE) and those developed by the Office of Safety and Mission Assurance (OSMA).

1) Standards under the responsibility of the OCE: The OCE has established the NASA Technical Standards Program (NTSP) at the Marshall Space Flight Center to manage OCE's standards. Standards either being recommended for adoption or development/maintenance are vetted through the NASA Technical Standards Working Group (now known as the NASA Engineering Standards Panel (NESP)) for participation in the adoption/review/development process. The NESP has membership from the engineering organizations at each Center/Facility, as well as representatives from the OCE. Additionally, NESP has membership from the OSMA and the Office of the Chief Information Officer. For engineering standards, OSMA will engage NSC on a case-by-case basis as appropriate to the subject matter.

2) Standards under the responsibility of OSMA: OSMA policy development and review process, managed by the Safety and Assurance Requirements Division (SARD) of OSMA, treats the NSC the same as the separate divisions of OSMA resident at Headquarters. Specifically, the NSC is presented the opportunity, and has the same responsibility, for participating in documentation development and review for all requirements documents managed by OSMA. The process is documented in the NASA Headquarters Office Work Instruction (HQOWI) 1410-GD02 (Rev F) or electronically at http://nodis3.gsfc.nasa.gov/HQDQMS~Docs/QMS/HQ_OWI_1410_GA000_002_F_.pdf

The NSC participates in the standards development process explained above and believes that the established process is working. There is ample evidence of NSC's whole and complete participation in the entire standards process. This evidence includes both the OSMA requests for review and the NSC responses and was provided to the ASAP on December 15, 2009. This addresses fully the recommendations made by the ASAP, and NASA requests that this recommendation be formally closed.

Tracking Number 2008-01-05
NASA Safety Reporting System Benchmarking
NASA Response to ASAP Follow-up Comments 2009

ASAP Comments (February 3, 2009)

The NASA response was very thorough in addressing the ASAP recommendation, the purpose of the NASA Safety Reporting System (NSRS), and its uses. The information provided by NASA regarding benchmarking the NSRS with the Aviation Safety Reporting System and the Patient Safety Reporting System was extremely useful in clarifying the NASA guarantee of anonymity. Whereas the NASA response to the ASAP recommendation was very clear about the guarantee of anonymity versus confidentiality, the ASAP concludes that such clarity might be lacking in the NSRS pamphlet, Web page, and supporting briefing materials. The ASAP therefore recommends that NASA conduct an across-the-board review to ensure that published information on this subject cannot be misconstrued. The Panel noted another example of the apparent misunderstanding of anonymity versus confidentiality when reviewing the Jet Propulsion Laboratory (JPL) website, which states "NSRS is a confidential, voluntary and responsive reporting channel for NASA employees and contractors." As NASA explained in its response, the NSRS cannot guarantee confidentiality.

NASA Response

The NSRS Program Manager (in conjunction with the NASA Headquarters Office of Public Affairs and NASA Center and Component facility points of contact) has conducted three separate quality assurance reviews of all NSRS marketing materials and associated Web sites during fiscal years 2008 and 2009. The JPL legacy Web site cited by ASAP was corrected within 48 hours of when the discrepancy was identified at the ASAP meeting. Based on these thorough reviews, NASA has determined that no additional changes are needed at this time to NSRS marketing materials. This addresses fully the recommendations made by ASAP. NASA briefed this information to ASAP on December 15, 2009, and requests that this recommendation be formally closed.

Tracking Number 2008-02-07
Accident Review Timeliness
NASA Response to ASAP Follow-up Comments 2009

ASAP Comments (February 3, 2009)

The ASAP is extremely pleased with the NASA response to this recommendation. The NASA plan of action will ensure timeliness in completing mishap reviews and endorsements; performing Agency and Center-level trend analysis on mishaps, close calls, and root causes; establishing a closed-loop tracking system for retention of lessons learned and closeout of recommendations and corrective actions; and submitting monthly reports to NASA senior management. Because projected completion dates for some of the actions extend to mid-2009 and the Panel cannot access some of the referenced Web sites, the ASAP requests that NASA conduct a follow-up briefing at the ASAP third quarterly meeting in 2009 to review progress and results. In addition, the issue that has not been addressed--and still is unclear to the ASAP--is whether the process that has been established for safety mishaps also applies to flight and mission failure investigations.

NASA Response

As requested, the NASA Office of Safety and Mission Assurance (OSMA) did provide ASAP with a briefing at the third quarterly meeting in July 2009 at the Jet Propulsion Laboratory. An update to the July status is provided below:

2008-02-07 Action 1: (Recommend Closure)

NASA has initiated mishap and close call trending at the Agency level as well as the Center level. Since July 2008, NASA has completed trending on the number and type of mishaps and close calls and presented these trends to NASA's senior management at the monthly Baseline Performance Review (BPR) which is chaired by the Associate Administrator. Additionally, NASA makes the trending and statistics available (Agency wide) via the NASA Safety Center Web site at: <http://nsc.nasa.gov/> and the NASA Mishap Investigation Web site at: <https://secureworkgroups.grc.nasa.gov/mi>. (ASAP members can access the NASA Mishap Investigation Web site to obtain these briefings).

2008-02-07 Action 2: Part 1: (Recommend Closure)

NASA has completed the development of the NASA Root Cause Analysis Tool (RCAT). The RCAT is designed to facilitate the analysis of anomalies, close calls, and accidents and the identification of appropriate corrective actions to prevent recurrence. The RCAT software provides a quick, easy, accurate, and repeatable method to perform and document root cause analysis, identify corrective actions, and perform trending. NASA has provided all NASA Centers with the software via the Mishap Investigation Support Specialist at each Center. NASA has provided a link to request the software on the Mishap Investigation Web site at <https://secureworkgroups.grc.nasa.gov/mi> and the NASA OSMA Web site: <http://www.hq.nasa.gov/office/codeq/links.htm>. Using these links, the software has been requested by 35 external Agencies and organizations for their use. To date, the following have been approved and have received the software: Department of Defense Explosives Safety Board; EMCOR Government Services; General Dynamics Advanced Information Systems; Jacobs Engineering, Science, and Technical Services Group; L-3 Communications; Lockheed

Martin; United States (U.S.) Army Combat Readiness/Safety Center; U.S. Army Research Institute, U.S. Forestry Service; U.S. Navy; U.S. Nuclear Regulatory Commission; and the United Space Alliance. (Other companies are still in the approval process.)

2008-02-07 Action 2: Part 2 – Action Open: (Projected Completion - August 2010)

Using the NASA RCAT, NASA has initially recorded the “Causes of Mishaps” in nearly 50 percent of the Type A mishaps, Type B mishaps, and high visibility mishaps and close calls (41 of 86 cases) from 2004-2009. NASA will complete the input of case file information, cause data, and recommendations from mishaps. Once the remainder is completed, the data will be analyzed. Analysis of cause trends will be provided quarterly at the BPR.

2008-02-07 Action 3: (Recommend Closure)

At the BPR, NASA currently provides a summary of mishap statistics and metrics. As part of this briefing, NASA provides senior management with a list of all open/ongoing investigations, and they are discussed briefly. Additionally, NASA provides findings from Mishap Warning Action Response(s), and/or a finding or point of significance from a mishap investigation that has been completed. The briefing charts are available to all who attend and are posted on the NSC Web site and the NASA mishap investigation Web site.

2008-02-07 Action 4: (Recommend Closure)

For Type A, Type B, and high visibility mishaps, NASA currently has a process in place to evaluate the Incident Reporting Information System (IRIS) cases, verify that corrective action plans have been developed by the responsible organizations, and track the corrective actions to closure. NASA has been trending the data on the corrective actions documented in IRIS, and occasionally provides this information to senior management at the BPR. Because this is an ongoing process, and is currently operating efficiently, no further action is required.

2008-02-07 Action 5: (Projected Completion - January 2010)

The Agency is working hard to ensure a greater timeliness in the review of Type A and Type B mishap reports.

NASA has evaluated all Type A, Type B, and high visibility mishaps from 2004 to the present time, located completed endorsement letters, and identified reports needing endorsement. All endorsing officials that have not completed required endorsements have been notified of their open actions. NASA is tracking closure of these items. Through this effort, there has been a significant reduction in the backlog of cases requiring endorsement. Additionally, there has been a significant reduction in the time it is taking endorsing officials to complete endorsements of reports completed in 2009, when compared to earlier years.

NASA will provide a chart on this prior to the next ASAP meeting in April 2010.

ASAP Comment/Question 2009 Fourth Quarter

In addition, the issue that has not been addressed--and still is unclear to the ASAP--is whether the process that has been established for safety mishaps also applies to flight and mission failure incidents.

NASA's Response (Recommend Closure)

In answer to ASAP's question related to whether the process established for safety mishaps also applies to flight and mission failure investigations, NASA provides the following answer:

Yes, the investigation process that has been established for safety mishaps also applies to flight and mission failure investigations as follows.

Using the program's mishap preparedness and contingency plan and NASA Procedural Requirements (NPR) 8621.1, the appointing official determines if the incident is a mishap. All mission failures are considered mishaps. [See definition below for mission failure. Prior to each Space Shuttle mission, minimum (Category 1) mission success criteria are developed and approved; failure to achieve any one of the Category 1 mission priorities is grounds for declaration of a mission failure. Mission priorities are briefed at the Agency Flight Readiness Review prior to each Space Shuttle mission. For the International Space Station (ISS), an example of mission failure would be an incident that requires de-manning of the Station. In both cases, the *Agency Contingency Action Plan (CAP) for Space Operations (SO) delineates mishap response procedures.*] Any injury onorbit is treated as a mishap per the requirements in NPR 8621.1. Property damage, depending on the nature of the incident, may be considered a mishap.

Some examples of incidents that would be considered in-flight mishaps are:

- A crewmember is injured and must be returned to Earth prior to mission completion.
- An in-flight fire occurs.
- There is a collision between a visiting vehicle and the ISS.
- There is an incident which requires NASA to de-man the ISS (thereby failing to complete the program's mission).

Some examples that would not be considered mishaps include:

- ISS is struck by a meteor (considered a natural phenomenon),
- A line replaceable unit (LRU) fails and requires maintenance and/or replacement.
- Hardware failure (e.g., a treadmill) during testing and analysis. (If an LRU failed due to human error or collision, that would be considered a mishap).

When an incident occurs, the appointing official consults appropriate senior management to classify the incident. Because each incident is unique (just as those that occur on the ground), some judgment is involved in this decision process as management considers a variety of factors such as: if mission objectives were reached; if natural phenomena were involved; if the damage occurred during testing; or if damage was due to normal use, wear, and tear. Depending on the circumstances, a number of these instances are exempt from mishap investigation, as is stated in NPR 8621.1, paragraph 1.2.2. To the extent that these are needed, NASA adds words to the appropriate Mishap Preparedness and Contingency Plans during their normal review and update process to clarify what is a mission failure, what is test damage, and what is acceptable and expected damage.

If a space flight incident is classified as a mission failure or a damage or injury mishap, it is investigated and addressed per the requirements in NPR 8621.1. When a space flight incident is not classified as a mishap, it may be classified as an in-flight anomaly (IFA). All IFAs receive a thorough engineering investigation, where recommendations are tracked to closure through a work instruction (MGT-OA-019). As well as the work instruction, there is a program requirement that all IFA investigations and results are vetted through project- and program-level boards before the next flight (Space Shuttle Program) or stage (ISS); the Engineering Technical Authority and Safety Technical Authority are mandatory board members. In addition to the IFA process, a mishap/close call investigation may also be used if senior management feels it is warranted to provide additional resources or due to the visibility of the event.

For additional information on NASA's definitions and exceptions, please see text below and NPR 8621.1.

Definitions:

Per NASA procedural requirements, a mishap is an unplanned event that results in at least one of the following:

- a. Injury to non-NASA personnel, caused by NASA operations.
- b. Damage to public or private property (including foreign property) caused by NASA operations or NASA-funded development or research projects.
- c. Occupational injury or occupational illness to NASA personnel.
- d. NASA mission failure before the scheduled completion of the planned primary mission.
- e. Destruction of, or damage to, NASA property except for a malfunction or failure of component parts that are normally subject to fair wear and tear and have a fixed useful life that is less than the fixed useful life of the complete system or unit of equipment, provided that the following are true: 1) there was adequate preventative maintenance; and 2) the malfunction or failure was the only damage, and the sole action is to replace or repair that component.

Certain incidents are not considered mishaps, such as destruction or damage to any property (public, private, or Government) on a Center or involving NASA property on the ground outside the Center's gates, as a direct result of: 1) Weather conditions such as, but not limited to, hurricane, lightning, tornado, high winds, dust storm, tidal wave, tsunami, water spout, or ice/snow loads; 2) Natural phenomenon such as, but not limited to, a flood, landslide, earthquake, meteoroid landing, or volcanic eruption; and 3) Wild fire; etc.

In addition, test-induced damage is not considered a mishap provided that all of the following are true:

- a. The test-induced damage did not result in:

(1) Injury, illness, or fatality.

(2) Damage to public property, other Government agency property, or private property (e.g., a personal vehicle), regardless of location of that property.

(3) Hazardous hardware debris leaving the test cell, test chamber, protected facility, and/or test range.

b. The facility and test equipment functioned properly (except when functions of the facility and/or test equipment themselves are being tested and are part of approved test objectives).

c. The damage is limited to test article(s) or test facility(ies), and the risk of damage was formally documented and accepted via signature before the test. The type or general category (i.e., water damage, structural failure, thermal overload) of test-induced damage was documented as a designed/intended or potential outcome of the test, and the risk (including related uncertainties) of the test-induced damage was formally accepted by appropriate authority(ies). Depending on the test, the appropriate authority may be the owner(s) of the damaged property and/or the person(s) responsible for funding replacement of damaged equipment (e.g., owner of the test article, test support equipment, test cell, chamber, pad, protected facility, and/or range, project, or program manager).

Note: NASA conducts tests to better understand and mitigate complex design, manufacturing, or operational issues. The objective of testing is to provide NASA with confidence that the system meets its technical and programmatic requirements and can successfully and safely perform its mission in the operational environment. Some tests, by their nature, are designed and intended to result in hardware damage: for example, a structural test-to-failure. Other tests are aggressive in nature, and test-incurred damage often occurs, and the knowledge gained is used to improve designs.

These instances of test damage would be a reportable NASA mishap if the failure/damage manifested was associated with procedural errors or with a noncompliance to design or construction requirements OR if it caused harm to personnel or to uninvolved equipment, facilities, or property. For the purposes of mishap determination, development tests are not "missions" nor are development test objectives "mission objectives" unless specifically defined as such in the program, project, or mission premishap plan.

NASA further defines a mission failure as a mishap, of whatever intrinsic severity, that prevents the achievement of the mission's minimum success criteria or minimum mission objectives as described in the mission operations report or equivalent document.

Note: A mission failure applies only to a NASA program's mission, and not a test or ongoing institutional operation. If a program accomplishes all minimum success criteria but not "full mission objectives," it is not a mission failure (even though in some cases it may appropriately be classified and investigated as a close call).

For reference, the original ASAP recommendation 2008-02-07, dated July 31, 2008, and the original NASA response are provided below:

Original Recommendation 2008-02-07 (July 31, 2008)

The ASAP urged that greater timeliness be achieved in completing accident reviews. The Panel also recommended that an organized and rigorous mishap trend analysis effort be undertaken Agency-wide to identify causal trends at an Agency level as well as by Center. The results of this analysis should be briefed on a regular basis to senior Agency leadership. The Panel would like to see the Center analyses during their visits to field operations. The Panel recommended that a policy be implemented to brief senior leadership of initial causal analysis in a timely fashion after major mishaps. Finally, the Panel recommended that a closed loop management tracking system, similar to that used for ground mishaps, be developed to ensure implementation of lessons learned from flight failure investigations.

Original NASA Response

2008-02-07 Action 1:

NASA has initiated mishap and close call trending at the Agency level as well as the Center level. Since July 2008, the NASA Safety Center (NSC) has completed trending on the number and type of mishaps and close calls and presented these trends to NASA's senior management at the monthly Baseline Performance Reviews (BPRs) which is chaired by the Associate Deputy Administrator. (Action 1: Completed).

2008-02-07 Action 2:

NASA will complete the development of the NASA Root Cause Analysis Tool to provide the Agency with the capability to systematically evaluate and electronically document proximate, intermediate, and root causes for all mishaps and close calls rather than doing the analysis manually. Once completed, NASA will take all Type A and Type B mishap reports from the last three years, and all those in the future, and use the tool to document, analyze, and electronically trend the causes of mishaps. Mishap-cause trending will be presented at monthly BPRs.

(Action 2: Projected completion and initial presentation to the BPRs - August 2009).

2008-02-07 Action 3:

Currently, for each Type A mishap, Type B mishap, and high visibility mishap, the NASA mishap investigation board provides an out brief to all endorsing officials (Chief, Safety and Mission Assurance, Chief Engineer, Chief Health and Medical Officer (when the mishap involves injuries, illnesses, or fatalities) and the responsible Center Director or Associate Administrator). The out brief includes a summary of the events that led up to the mishap; proximate, intermediate, and root causes; and recommendations.

Additionally, the NSC also has created a comprehensive web site for Agency personnel to access to view the latest safety data for the Agency. (Part I) To expand the dissemination of information, after each out brief, the NSC will create a two-page summary (including findings and causes) and include that summary in the briefing to NASA senior management at the monthly BPR. (Action 3: Out briefs are an established

part of the process; Web site is completed. Projected start of monthly BPR briefings - December 2008).

2008-02-07 Action 4:

Agency personnel are working to complete a closed loop tracking system to ensure that lessons learned from mishaps are input to the Lessons Learned Information System. Additionally, the NSC hired an employee to monitor and track mishap and close call recommendations to ensure that the 1) corrective action plans have been developed by the responsible organization, 2) the recommendations have been implemented, 3) the lessons learned have been shared across the Agency. The NSC will generate trending of NASA's success on implementing mishap and close call recommendations. (Action 4: Projected completion - May 2009).

2008-02-07 Action 5:

The Agency is working hard to ensure a greater timeliness in the review of Type A and Type B mishap reports. Currently, the NSC is developing information for all endorsing officials indicating which reports are waiting for a review and endorsement. The NSC is also providing support in the Office of Safety and Mission Assurance (OSMA) analysis and critique of all Type A and Type B mishap reports Starting in January 2009, the NSC will complete all Type A and Type B mishap report critiques for OSMA and forward the signed critique to OSMA and the mishap investigation board within two weeks of the mishap. OSMA will use the critique to generate OSMA's endorsement letter. The NSC's newly expanded role in the detailed review and analysis of the reports will begin to shorten OSMA's response time for these reviews. (Action 5: Projected completion - January 2009).

Tracking Number 2008-02-08
Fall Protection Standard
NASA Response to ASAP Follow-up Comments 2009

ASAP Comments (February 3, 2009)

The ASAP is pleased that the NASA response embraced development of an Agency-wide fall protection policy; however, the length of the implementation period is excessive. The ASAP encourages NASA to implement this standard as soon as possible and would appreciate additional updates upon completion of interim milestones.

NASA Response

On April 17, 2009, well ahead of our projected completion dates of 2010-2011, NASA issued a formal modification to NASA Procedural Requirements (NPR) 8715.3, NASA General Safety Program Requirements (specifically paragraph 3.18) which addressed expanded requirements for fall protection. (NPR 8715.3 is available at:

http://nodis3.gsfc.nasa.gov/displayDir.cfm?Internal_ID=N_PR_8715_003C_&page_name=main.)

The changes incorporated within the revision to the NPR reiterate the existing applicability of the most recent versions of Occupational Safety and Health Administration (OSHA) regulations found in 29 Code of Federal Regulations (CFR) 1910 and 29 CFR 1926 and mandates additional voluntary consensus standards (American National Standards Institute and American Society of Safety Engineers) above and beyond the OSHA requirements. NASA verifies compliance to both the OSHA and NASA requirements during routine Center audits. This addresses fully the recommendations made by the ASAP. NASA briefed this information to the ASAP on December 15, 2009, and requests that this recommendation be formally closed.

Tracking Number 2008-03-02
Industrial Safety Performance Metrics
NASA Response to ASAP Follow-up Comments 2009

ASAP Comments (February 3, 2009)

The ASAP would like to thank NASA for its response to this recommendation. Although the Agency does not like to collect data for use in comparing Centers that perform different types of work, the ASAP contends that periodic senior management review of industrial safety data is both prudent and advisable. Through this review, key Center senior leaders will be able to assess leading indicators of potential issues, not only in the safety area, but also in other fields relevant to Center operations. The ASAP does agree with NASA that continuous improvement constitute a critical goal of all safety performance and that such improvement also extends to the contractor workforce.

For example, when analyzing safety data, if one sees a healthy safety pyramid, one can be reasonably assured that there is good reporting and that the culture is easily and multidirectionally sharing good news and bad news. However, an unhealthy safety pyramid or “safety pencil” can serve as a warning sign of some potentially serious issues in reporting. The failure to report can be seen in different ways; perhaps it is a breakdown in the reporting process itself or an example of existing fear in the culture of the organization. This analysis represents a classic leading management indicator, and either outcome means the management must take timely action to rectify the situation.

Therefore, the ASAP requests that, at every quarterly meeting, NASA present leading and lagging industrial safety performance metrics similar to those tracked by Marshall Space Flight Center (MSFC) so that the ASAP can review the data for all Centers, including NASA mishap data and a status update on the report for each mishap. This approach will give the Panel and NASA meeting attendees an opportunity to gain an improved understanding of Agency and Center safety processes. The Panel believes that such updates will serve as a platform for launching a more robust discussion of safety culture, mishap prevention, contractor management, and do other issues.

NASA Response

NASA agrees with ASAP that periodic senior management review of industrial safety data is prudent and advisable. The Office of Safety and Mission Assurance (OSMA) has also provided all Centers with the MSFC material, indicating the use of this format was an ASAP-preferred practice and should be used as a guide for future ASAP briefings. Additionally, NASA provides top level safety data and metrics similar to those in the MSFC presentation to senior management at the monthly Baseline Performance Review (BPR). The data provides managers with a comparison across the Centers of information such as civil service employee lost time rates, number of mishaps, and more. It allows the managers to determine if their Centers/organizations have a good reporting culture. At these reviews, senior managers can ask questions and follow up on safety topics of interest. To date, the management has been satisfied with the content and scope of these presentations. These BPR presentations are available to NASA employees, contractors, and ASAP via the NASA Mishap Investigation Web site at:

Enclosure 5

<https://secureworkgroups.grc.nasa.gov/mi>. Agency safety metrics are also posted on the NASA Safety Center Web site at: <http://nsc.nasa.gov/>.

Additionally, all 30-workday status reports for ongoing investigations are posted on both Web sites. The ASAP is welcome to observe these metrics to evaluate whether the information might provide the insight and comparison they are seeking.

For reference, the original ASAP recommendation 2008-03-02, dated September 12, 2008, and the original NASA response are provided below:

Original Recommendation 2008-03-02 (September 12, 2008)

To expedite future ASAP site visits, the Panel recommends that other Centers present leading and lagging industrial safety performance metrics similar to those tracked by Marshall Space Flight Center (MSFC), establishing a basis for discussions with the ASAP. This approach would give the Panel opportunities for gaining a better, more consistent understanding of safety processes; improving the bases for comparing and contrasting programs; and perhaps also supporting NASA cross-pollination of good ideas.

Original NASA Response

NASA agrees that the MSFC safety performance metrics presentation to the ASAP provided a solid framework for discussion. The Office of Safety and Mission Assurance (OSMA) provided a copy of the material that MSFC presented to the recent ASAP meeting to all Centers, indicating that the use of this format was an ASAP-preferred practice.

Agency safety metrics are also posted on the NASA Safety Center Web site at: <http://nsc.nasa.gov/>. There are summary charts posted that compare Center performance in lost time cases, mishaps, close calls, and property damage; provide Agency aggregate data on the Occupational Safety and Health Administration recordable accident sources (both civil service and contractor); and provide individual Center reports on lost time injury rates.

The ASAP is welcome to observe these metrics to evaluate whether the information might provide the insight and comparison they are seeking. It is Agency practice not to use these data to compare and contrast Center progress as this is counterproductive for a mishap prevention program, and promotes the wrong kind of competition, and drives down the necessary reporting of mishaps. Our expectations are for the Centers to achieve a continuous improvement in their mishap experiences based on their past records.

Tracking Number 2008-03-05
Open CAIB Recommendations
NASA Response to ASAP Follow-up Comments 2009

ASAP Comments (February 3, 2009)

Although the NASA response indicates that NASA accepts the risks associated with the three remaining open Columbia Accident Investigation Board (CAIB) recommendations, the response does not clearly confirm that NASA has formally accepted the residual risk and has closed out the three CAIB recommendations. If NASA has formally accepted the residual risks and has closed out the recommendations with regard to NASA internal reporting, the response should indicate how and when NASA accomplished these actions. Regardless of the NASA status, the ASAP will continue to need periodic updates from NASA in all areas of pertinent activity (e.g., investigation, analyses, testing, in-flight anomalies, inspection, maintenance) pertaining to the three open CAIB recommendations so that the Panel can fulfill the legal requirement to provide an updated annual report to Congress until retirement of the Shuttle. In addition, if and when the decision is made to extend Shuttle flights beyond 2010, the Panel asks that NASA initiate a discussion with the ASAP on the Agency's approach to satisfying the CAIB recommendation to recertify the Shuttle.

NASA Response

ASAP Recommendation 2008-03-05 refers to the following three CAIB recommendations that the Return to Flight (RTF) Task Group determined that the intent of the CAIB recommendation had not been met:

- CAIB 3.2-1, External Tank (ET) Thermal Protection System (TPS) Modifications.
- CAIB 3.3-2, Orbiter Hardening and Thermal Protection System Impact Tolerance.
- CAIB 6.4-1, Thermal Protection System On-orbit Inspection and Repair.

The NASA Space Shuttle Program (SSP) formally closed these recommendations through its Program Requirements Control Board (PRCB) process. Specifically:

- CAIB recommendation 3.2-1 was closed at the July 1, 2004, PRCB.
- CAIB recommendation 3.3-2 was closed at the February 6, 2004, PRCB.
- CAIB recommendation 6.4-1 was closed at the January 24, 2005, PRCB.

Headquarters approved all of the CAIB action closures and, on June 3, 2005, the NASA Administrator signed the Return to Flight Implementation Plan which was delivered to Congress prior to first return to flight in July 2005. NASA's Implementation Plan for Space Shuttle Return to Flight and Beyond (Final Edition, May 15, 2007) provides the final formal

documentation of the implementation status of all CAIB recommendations, NASA SSP additional “Raising the Bar” actions, and CAIB observations. This RTF implementation plan reflects the status for each of these CAIB recommendations as closed.

NASA has formally accepted the residual risk associated with CAIB recommendations 3.2-1, 3.3-2 and 6.4-1 prior to each flight of the Space Shuttle, by approval of related program- and project-level hazard reports as follows:

- CAIB Recommendation 3.2-1 related hazard reports:
 - Program integrated external debris hazard report, **IDBR-01, Ascent Debris Impact to the Space Shuttle Vehicle**, provides an integrated risk assessment of the Space Shuttle debris environment.
 - ET project hazard reports, **T.02, Loss of External Tank Thermal Protection System**, and **T.04, External Tank Ice Debris**, document sources of ET-generated debris and provide controls for maintaining expected debris sources within defined allowable debris masses, which were determined through foam and ice debris impact testing.
- CAIB Recommendation 3.3.-2 related hazard reports:
 - Program integrated external debris hazard report, **IDBR-01, Ascent Debris Impact to the Space Shuttle Vehicle**, addresses the risks for each debris source, the likelihood of debris impacting the vehicle, and the Orbiter’s impact tolerance.
 - Orbiter project hazard report, **ORBI 249, Structural Overheating Caused by Non-Impact Related TPS Failures**, addresses risks to TPS materials and components critical to orbiter survivability during the severe heating environment of space flight, and includes all orbiter tiles, blankets, gap fillers, thermal barriers, and associated seals.
 - Orbiter project hazard report, **ORBI 007, Loss of Outer Moldline Due to Debris Impact**, defines the damage tolerance capability of TPS materials and components critical to orbiter survivability, including the Reinforced Carbon-Carbon (RCC) wing-leading edge and nose cap, windows, and other TPS structures.
- CAIB Recommendation 6.4-1 related hazard reports and related documents:
 - SSP requirement to be capable of performing on-orbit inspection and repair each mission, as defined in NSTS 07700.
 - Program integrated hazard report, **IDBR-01, Ascent Debris Impact to the Space Shuttle Vehicle**.
 - Orbiter project hazard report, **ORBI 249, Structural Overheating Caused by Non-Impact Related TPS Failures**.

- Orbiter project hazard report, **ORBI 007, Loss of Outer Moldline Due to Debris Impact** provides risk acceptance rationale for the onorbit inspection capability and TPS repair options for both RCC and tile that are available.

NASA understands the ASAP's commitments to Congress with respect to the Shuttle and will be happy to provide updates concerning Shuttle activities related to CAIB Recommendations 3.2-1, 3.3-2, and 6.4-1 upon request.

If a decision is made to extend Shuttle flights beyond the currently planned manifest, NASA will meet with the ASAP and discuss our plans for addressing the CAIB recommendation to recertify the Shuttle. This addresses fully the recommendation made by the ASAP. NASA briefed this information to the ASAP on December 15, 2009, and requests that this recommendation be formally closed.