

National Aeronautics and Space Administration  
Office of the Administrator  
Washington, DC 20546-0001



January 6, 2010

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

Dear ~~Admiral~~ <sup>JOE</sup> Dyer:

In response to the Aerospace Safety Advisory Panel 2009 Second Quarterly Meeting, NASA's responses to six recommendations are enclosed.

I appreciate the time and dedication you and the Panel members give in advising NASA on our critical safety issues supporting the Nation's space program.

Sincerely, *& Semper Paratus!*

A handwritten signature in black ink, appearing to read "C. Bolden, Jr.", with a large, sweeping flourish at the end.

Charles F. Bolden, Jr.  
Administrator

6 Enclosures

1. 2009-02-01 Constellation Program's Technical Baseline
2. 2009-02-03 Hazard and Risk Matrix Definitions
3. 2009-02-05 Industrial Safety
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**Tracking Number 2009-02-01**  
**Constellation Program's Technical Baseline**

**Recommendation**

ASAP recommends that in maintaining the Constellation Program's technical baseline, NASA must develop, use and report in-process, and outcome metrics to assure risk management processes are being followed and that progress is being measured. Though design integration has progressed substantially, ASAP believes NASA's work process would be enhanced by adding quantitative measures that can be introduced, tracked, and reviewed periodically, thus serving as indicators of a successful work process.

**NASA Response**

NASA concurs. The Exploration Systems Mission Directorate (ESMD) and the Constellation Program require the use of quantitative participation metrics to enhance the effectiveness of risk management (RM) such as staleness, time in the system, etc. The Constellation Program recently completed a Lean Six Sigma Kaizen event focusing on the risk reporting process where metrics were reviewed. Revisions to metrics currently in use, as well as potential new metrics, will be included in updates to the directorate, program, and project-level RM plans which can easily be made available to the ASAP for review. Additionally, the Constellation Program Earned Value Management Systems Integrated Master Schedules, Technical Performance Measures, and Safety metrics (Loss of Crew/Loss of Mission) will provide insight into how well potential challenges to program goals and objectives are being met.

**Tracking Number 2009-02-03**  
**Hazard and Risk Matrix Definitions**

**Recommendation**

ASAP recommends that Hazard and Risk Matrix definitions be more quantitative in nature. Risk definitions must be improved and made more precise. Since approving the risk and accepting the risk are not the same, these terms must be made more clear and differentiated, particularly in any information that is released. The ASAP also recommends that NASA train all of its new engineers and managers in its hazard and risk management processes, so that everyone can better appreciate and understand how this relates to their work.

**NASA Response**

NASA agrees with ASAP recommendation that risk matrix definitions for hazards should be more quantitative in nature. As a minimum, the likelihood definitions should be expressed quantitatively as they refer to an inherently probabilistic concept. With respect to consequence severity definitions, they should be clearly defined in such a way that severity levels represent only one consequence type (e.g., human life). This enables the decision maker to differentiate safety-related risk issues from others.

NASA also agrees with the ASAP recommendation that risk characterization must be improved. NASA procedures for risk assessment and risk management require that risk be characterized in terms of three components:

- The accident scenarios that may happen. This is especially useful when organized in logical fashion to identify the cause-consequence relationship of the chain of events that constitute risk scenario.
- The likelihood of the risk scenario. This can be expressed quantitatively in the form of a probability over some reference period of time or set of activities or as a “frequency,” i.e., a probability per unit of time.
- The severity of the consequences associated with the risk scenario that has been identified.

We believe defining risk in terms of scenarios introduces rigor in the evaluation of likelihoods. This is key to improving the technical basis of risk information and the effective use of matrices with quantitative scales.

NASA will provide clear definitions of risk acceptance and risk approval in the revised Human Rating NASA Procedural Requirements.

With respect to the hazard and risk management training for new managers and engineers, the Office of Safety and Mission Assurance (OSMA), the NASA Safety Center, and the Office of the Chief Engineer are working to develop courses for RM and system safety (SS) as part of the

Safety and Mission Assurance (SMA) Technical Excellence Program (STEP). Level 1 (introductory) course for RM and SS has been completed. More advanced classes are planned to be available for levels 2-4 in the fall of 2009. Course descriptions are available at <http://www.bmr-inc.com/nasa/><<http://www.bmr-inc.com/nasa/>>.

**Tracking Number 2009-02-05**  
**Industrial Safety**

**ASAP Recommendation**

ASAP recommends the Industrial Safety team more openly communicate the results of Skip-Level Assessments of supervisors to senior leadership. This will allow leadership to become increasingly involved in, and more knowledgeable of, the Industrial Safety Program.

**NASA Response**

NASA disagrees and believes there is a misunderstanding about the purpose of the Skip-Level Assessment tool employed by the Johnson Space Center (JSC). The primary purpose of the JSC Skip-Level Assessments is to provide a discreet mechanism for employees to provide input into the performance evaluation of their supervisor. Through this assessment mechanism, employees are asked to answer three questions about their direct supervisor:

What would you like this manager to start doing?

What would you like this manager to stop doing?

What would you like this manager to continue doing?

The employee's answers to these questions are conveyed directly to the employee's second-level supervisor who, in turn, uses the information as input for performance planning/evaluation related to the employee's direct supervisor. (For example, the JSC (SMA) Director's Division Chiefs complete the Skip-Level Assessment on the JSC SMA Director. These assessments are compiled and delivered to the JSC Center Director who then uses the information to plan/modify or appraise the JSC SMA Director's performance.)

The JSC Skip-Level Assessment approach helps JSC leaders evaluate the performance of managers who work for them. As discussed at the 2009 Second Quarterly Meeting at JSC on April 29-30, 2009, there is no Agency-wide prescribed process for Skip-Level Assessments. NASA believes that methods such as the Skip-Level Assessments employed by the JSC Director are useful in understanding a manager's leadership performance. The Skip-Level Assessments are not designed to provide insight into the Center's Industrial Safety Program. Based on the three questions asked, it is rather unlikely (but not impossible) that there have been any safety-related comments provided in the Skip-Level Assessment, since safety-oriented information is not explicitly elicited in the review. The two supervisors involved are not expected to share the planning or appraisal information with the safety organization.

At the Agency level, NASA is developing a safety culture program that will help to elevate leadership knowledge and involvement in NASA's safety efforts. The safety culture program will integrate components of assessment, education, and consultation to improve safety awareness, attitudes, management, and performance throughout the Agency. Part of the program will include measuring the level of safety culture on an annual basis. The Agency's Safety Culture Working Group (formed in early 2009 with representation from each NASA Center) is currently reviewing the proposed survey instrument to ensure that it is succinct, relevant,

accurate, and useful at all levels of the workforce. The Kennedy Space Center (KSC) has volunteered to test the survey; this test was scheduled for August 2009. NASA believes that this safety culture program will provide leaders, managers, and employees with a capability to intervene constructively to improve the safety culture underlying NASA's programs, projects, and operations.

**Tracking Number 2009-02-06**  
**Workforce and Management Issues**

**Recommendation**

ASAP recommends NASA acquire a means to continually identify workforce and management issues before they grow into even larger problems. Using a workforce survey is an accepted practice and can be integrated within normal Human Resources (HR) and program activities. Properly employed, this will serve as a proactive leading indicator of organizational effectiveness.

**NASA Response**

NASA uses a wide variety of comprehensive internal and external workforce surveys in order to continually, and proactively, identify and address workforce and management issues. Surveys are conducted by NASA Centers to address local workforce issues, as well as at the Agency level to address NASA-wide workforce and organizational effectiveness. The following response provides information on surveys conducted to address Agency-level workforce and organizational effectiveness issues and concerns.

**Federal Human Capital Survey**

Currently, NASA, through the auspices of the Office of Personnel Management (OPM), conducts the bi-annual Federal Human Capital Survey (FHCS). OPM has decided to conduct this survey on an annual basis, under the name "Employee New Point," beginning in 2010. This survey is the "hallmark" of Federal-wide workforce surveys and is used to evaluate and compare Federal agencies on a standard set of questions on work/life balance, management effectiveness, and work satisfaction. NASA analyzes FHCS results to determine trends and identify areas of concern for additional focus. Centers receive their own results and demographic data which they use to inform local improvement efforts. The Agency data is also analyzed by program area, and results of that review are forwarded to appropriate program community leaders. Many Centers present their survey results at "All Hands" meetings or post them in their Center newsletter or Web site. In 2005, for example, one Center used survey results to initiate a number of improvements in supervisory communication and human resources training that resulted in their overall scores increasing by almost six percent, the best improvement of any Center over the six years NASA has been using this survey. External entities, including the Partnership for Public Service, use the results to rate Federal agencies as a "Federal employer of choice." This year, NASA was ranked third out of 30 large Federal agencies.

**NASA Chief Historian Culture Survey**

The NASA Chief Historian Culture Survey, administered in 2006, was supported by the NASA History Office as follow-on to a survey which was originally administered in 1988 for the book, *Inside NASA*. The 2006 survey asked the same questions as the original survey and included additional questions from the OSMA. The additional questions covered management integrity and communication, issue escalation and employee feedback, and organizational support in getting the job done. The Chief Historian Culture Survey results were briefed to then-Administrator Griffin and led to his request for more information on the findings related to the

additional areas added by OSMA. In response, the 2007 NASA Culture Survey (NCS) was developed.

### **NASA's Culture Survey**

In addition to an on-line survey instrument, this survey included focus groups and Center assessments. The data reported was weighted at the Center level to serve as a baseline, and over 60 NASA organizations and several mission and support functions were provided their individual results for local diagnosis and action. The overall findings were presented at a Senior Management Council in January 2008, and a determination was made that more can be expected across the Agency regarding open communications and organizational support in getting the job done. As a way to move forward, the study team recommended a "go to" organizational goal that describes the focus, managerial practices, and expected results of this model organization. A key aspect of this organizational goal was underscored in the Administrator's message on January 28, 2008, to the workforce, *A Day of Remembrance*, in which he articulated everyone's responsibility for building trust and open communication.

In addition, NASA developed and widely distributed a Culture Jump-Start Guide that identified promising practices having known positive impact on issues related to management honesty, upward and downward flow of communication, and support for a smooth-running organization.

### **Model Organizational Benchmarking Study**

As an outgrowth of the NASA Culture Study, the Office of Human Capital Management (OHCM) benchmarked and shared best practices used by nine organizations that exhibited the highest survey marks regarding the model organizational goal. The nine organizations that met these criteria were four organizations from KSC, two organizations from JSC, and three organizations from Marshall Space Flight Center (MSFC). The nine organizations were reviewed in three primary areas: Management Integrity and Communications, Issue Escalation and Employee Feedback, and Organizational Support.

The following best practices were found as a result of the study:

1. Management Integrity and Communications:
  - Maximize opportunities for face-to-face communications with employees.
  - Demonstrate the values you want others to follow.
  - Proactively solicit and respond to feedback.
2. Issue Escalation and Employee Feedback:
  - Clearly define and follow issue escalation process.
  - Educate, coach, and support employees on the issue-escalation process.
  - Create an environment where differing opinions are encouraged.
3. Organizational Support:
  - Reward and recognize employees in significant and meaningful ways.
  - Invest in development opportunities to ensure employee success.
  - Promote a collaborative environment.

Results of the study and the findings were distributed to all NASA Officials-in-Charge, HR Directors, and Training Officers at each NASA Center. Best practices and lessons learned were incorporated into training and development courses depending upon the course topic and content. Additionally, OHCM has incorporated this study and best practices into its Agency-level leadership and communications course entitled, *Leading through Effective Communications*. This course has been offered three times in 2009 and will continue to be offered to the NASA workforce on an ongoing basis. OHCM has also provided the study as a benchmark to its 2008 Senior Executive Service Candidate Development Program participants to use as a guide in their leadership development.

### **Space Shuttle Employee Survey**

In addition to the Agency-wide workforce surveys, NASA also conducts surveys that are targeted to special groups of employees and organizations. As NASA enters a period of transition and its related uncertainties, senior leadership is carefully monitoring employee perceptions and taking actions to continue to support a positive workplace culture and address employees' needs.

For example, as part of the Shuttle transition planning, the Space Shuttle Program, KSC, JSC, MSFC, and Stennis Space Center (SSC), have been surveying civil service Space Shuttle employees on an annual basis. In late summer 2008, the survey was sent to over 2900 civil service employees at the four Centers who had a role in the Shuttle Program from October 2007 to June 2008. The Web-based survey consisted of up to 18 questions that were a mix of opinion, demographic, and open-ended. The next survey is scheduled for release in late summer 2009.

This survey, which will continue to be administered annually to the Shuttle workforce, is an important tool for the Agency to gather data for human capital planning and to communicate to employees that their opinions matter. The survey focuses on individual opinions of Shuttle employees:

- Their intent to stay and when they might leave the program.
- Their perception of their ability to support—at the appropriate level—Shuttle through program retirement (Mostly aimed at matrix employees).
- What motivates employees to stay with the program?
- Employee perception on how NASA leadership is doing on communicating Shuttle transition and retirement.

Since the inception of the survey in 2006, results have been used to assist the human capital community with planning for Shuttle transition. Additionally, results have been used to improve employee communications by sponsoring focus group sessions and conducting “All Hands” meetings at KSC, MSFC, SSC, JSC, and the White Sands Test Facility. Additionally, a set of managerial talking points have been developed to help supervisors get information to employees in a timely manner. In response to employee comments, a Shuttle transition Web site was launched two years ago along with *Rendezvous*, a quarterly magazine aimed at keeping employees informed on transition-related issues. The Web site located at <http://rendezvous.jsc.nasa.gov/> includes blogs by leadership, a place for employees to verify rumors they have heard, links to other transition-related Web sites, and news updates. Due to the

tremendous success and use of this Web site, more features are scheduled to be added in the coming year.

### **NASA's New Employee Survey**

As NASA continues to assess its overall hiring process, one area of focus includes the employee orientation or on-boarding experience. To that end, OHCM has partnered with the NASA Shared Services Center and the Center Human Resources Offices to develop and implement an Agency-wide new employee survey. The instrument, which was implemented in August 2009, will be forwarded to all new employees who have been on the rolls for at least 30 days, but less than 90 days, and will solicit information on how well the Agency communicated with them beginning with the application and selection process through their entering on duty and first days of employment. The survey is also intended to capture how well a new employee is indoctrinated into the organization and their initial perceptions of what it is like working for NASA. The new employee survey will be used in conjunction with existing manager and applicant surveys to enable NASA to identify areas that are working well, along with surfacing opportunities for improvement in its hiring program.

### **NASA Exit Survey**

NASA also administers an exit survey which asks questions specifically designed to query departing employees about their employment experience while at NASA. Responses are analyzed and used to inform the Agency and guide any needed improvements in the organization.

NASA engages the workforce in surveys to continually assess the health and well-being of all employees and to continually improve organizational effectiveness. The surveys that have been mentioned are just a few that NASA administers to the workforce. These surveys, and the resulting analysis that drive changes as needed, are an indicator of NASA's commitment to its workforce.

OHCM will continue to ensure that the message of "what employees say" through surveys and other avenues is heard loud and clear by both senior leaders and rank-and-file employees. As noted earlier, these perceptions rise to the highest levels of the Agency, as evidenced by the activities of the Strategic Management Council and the Administrator. All NASA's missions are accomplished by the work of thousands of dedicated, highly-skilled and motivated people across the Agency, and their perceptions provide a critical measure of the Agency's success. If a NASA Center, directorate, or office, such as the OSMA, has identified an area of concern that it believes requires attention, OHCM stands ready to review the issue and develop additional questions which can be added to a current or ongoing survey instrument, such as the OPM Federal Human Capital Survey.

**Tracking Number 2009-02-07**  
**Safety Culture**

**Recommendation**

NASA, in all locations, needs a stronger quantitative and qualitative measurement of culture changes, done with rigor and frequency. ASAP subsequently recommends that NASA reinstitute a periodic culture assessment.

**NASA Response**

NASA agrees. In 2008, in a concerted effort to strengthen its safety culture, NASA began the development of a comprehensive Agency-wide safety culture program. When fully implemented, NASA's safety culture program will integrate components of assessment, education, and consultation to improve safety awareness, attitudes, management, and performance throughout the Agency.

Part of the safety culture program will include measuring the level of safety culture on an annual basis. NASA is currently developing a culture survey instrument that will be used throughout the Agency to measure knowledge and progress in all aspects of safety culture (individual and group values, attitudes, competencies, and patterns of behavior that determine commitment to, and the style and proficiency of, an organization's safety management). As part of the development process, Agency experts reviewed NASA's past efforts in conducting culture surveys and also evaluated current industry practices. The Agency developed a draft survey instrument that reflects knowledge gathered during the previous surveys and from industry.

Currently, the Agency's Safety Culture Working Group (formed in early 2009 with representation from each NASA Center) is reviewing the proposed survey instrument to ensure that it is succinct, relevant, accurate, and useful at all levels of the workforce. KSC has volunteered to test the survey; this test is currently scheduled for August 2009. NASA will adjust the survey as needed after the Kennedy Space Center test, and current plans call for deploying the survey throughout the Agency sometime in 2010.

NASA views the culture survey as a first step in a comprehensive program that encourages leaders to utilize quantitative data and qualitative feedback. The survey information will also help target educational and consultation needs and opportunities. The broader safety culture program goals of assessment, education, and consultation, aim, not only for greater benchmarking but, for greater insight, awareness, and actionable intervention options for NASA leadership, managers, and the workforce. When fully implemented, NASA believes that this safety culture program will provide leaders, managers, and employees with a capability to improve the safety culture underlying NASA's programs.

**Tracking Number 2009-02-08**  
**Knowledge Capture and Management Practices**

**Recommendation**

ASAP recommends that NASA adopt a best practice to standardize knowledge capture and management practices across all NASA Centers.

**NASA response**

NASA agrees that standardization of knowledge sharing activities is important to the extent that it focuses on the foundational aspects of knowledge sharing (e.g., lesson and case study development methodology) without compromising the flexibility required for addressing local learning strategies and knowledge sharing needs, which often differ based on the circumstances at a given point in time.

Knowledge sharing activities such as lessons learned and case studies serve as tools that promote organizational learning and preserve corporate knowledge. Several Centers have taken steps to institutionalize these activities. JSC and Goddard Space Flight Center (GSFC) each have a Chief Knowledge Officer, and the Jet Propulsion Laboratory (JPL) has a Chief Knowledge Architect, to coordinate and facilitate knowledge sharing, including collaborations with other Centers. KSC and Glenn Research Center (GRC) also have developed knowledge sharing programs that are fostering collaboration across Centers. The NASA Academy of Program/Project and Engineering Leadership (APPEL) in the Office of the Chief Engineer (OCE) serves as an Agency-wide resource for the creation and dissemination of lessons learned through its training courses, knowledge sharing forums, and publications. Similarly, OSMA, using NSC, develops and distributes a variety of publications including system failure case studies, cases of interest, and mishap warning action reports to ensure that important learning opportunities are documented and shared across the Agency. The Agency will continue to support and promote these efforts that are already in place and benefiting from active participation and cooperation.

The Agency also currently has several rich collections of lessons learned and case studies that are easy for NASA personnel to find, access, and search from their desktops. These databases include specific major operational lessons learned from human spaceflight programs as well as lessons about NASA's robotic and aeronautics programs. Table 1 lists sources for existing case studies and lessons learned. The list does not necessarily include all of the rich collections available, but provides an overview of what is available today for all NASA employees.

The diversity of knowledge sharing activities and offerings available to date reflects three main points. First, users have differing needs. Much of the knowledge that can benefit an engineer or project manager tends to be local, not fully universal. Second, organizations across the Agency use multiple learning strategies that use lessons learned and cases as training instruments. These include (but are not limited to) training courses, knowledge sharing forums, short workshops, electronic publications, videos, and databases. Finally, the range and variety of topics covered (which include: mission/project failures and successes; close calls; technical lessons learned; project leadership decisions; design cases; safety reminders; and personal insights based on experience) lend themselves to different lengths and formats.

The common denominator among NASA's knowledge sharing activities is their basis in practitioner experience coupled with the shared commitment to cultivating reflective practitioners, building communities of practice, and improving NASA's performance as a learning organization. Case studies and written lessons learned are typically developed from a combination of the following sources: personal interviews with practitioners; source documents such as briefings and engineering memos; historical or archival documents; first-person articles; academic or technical publications by practitioners; databases of lessons learned; and oral histories or video archives. The finished product is a narrative that conveys key knowledge, insights, and learning objectives while illustrating the complexity of the tradeoffs and decisions that practitioners faced.

NASA disseminates lessons learned and case studies through several channels. These include (but are not limited to): training sponsored by APPEL, the NASA Engineering Safety Center (NESC) Academy, OSMA through the NSC, and Center training and knowledge sharing organizations; the annual two-day Project Management (PM) Challenge training event, which features over a dozen case study sessions each year; the APPEL Masters Forums and Principal Investigator Forums; publications such as APPEL's ASK Magazine and the ASK the Academy e-newsletter, OSMA's Safety Messages, and Center newsletters such as JSC Today; and methods such as the Exploration Systems Mission Directorate's practice of having project risk managers link lessons learned to specific project knowledge-based risks in a continuously updated project risk record. Attachment 1 provides further descriptions of each.

A plan for preparing new operational lessons learned from human spaceflight programs will encourage continuation of the strong grassroots efforts already in place that have produced the volume of rich knowledge sharing materials currently serving the NASA workforce. OCE's future efforts will include creating a centralized resource on the NASA Engineering Network (NASA only) and the APPEL Web site (public) that offers links and enhanced searches for as many identified knowledge sharing resources as possible without duplicating any of the source data. The OCE will continue to implement all current OCE-funded work on lessons learned and case study development. In addition, the OCE is studying the feasibility of adding an annual data call to all NASA Centers to develop approximately ten additional cases per year specifically focused on, but not limited to, human spaceflight knowledge sharing and professional development. GSFC has created a document entitled "Creating Case Studies in NASA Project Management: A Methodology for Case Writing and Implementation" (see Table 1), which will serve as the standard methodology for the products created under this plan. This will ensure that cases added through this data call share a common approach while meeting the local knowledge needs of the Centers. Once new case studies are developed, they will be made available as training instruments to APPEL and all other training and development organizations across the Agency. In addition to the data call, OCE will continue to encourage Center management to familiarize themselves with the knowledge sharing work already underway (e.g. ongoing efforts at JSC, GSFC, JPL, KSC, and GRC), and to adopt those best practices that work best for their respective Centers.

**Table 1 – Lessons Learned and Case Study Resources at NASA**

| Name  | Web Address   |
|---|---|
| JPL Flight Anomaly WIKI*  | <a href="https://jplwiki.jpl.nasa.gov:8443/display/JPLFAD/Home">https://jplwiki.jpl.nasa.gov:8443/display/JPLFAD/Home</a>   |
| JSC Case Studies  | <a href="http://knowledge.jsc.nasa.gov/index.cfm?Event=CaseStudies">http://knowledge.jsc.nasa.gov/index.cfm?Event=CaseStudies</a>   |
| GSFC Case Studies   | <a href="http://library.gsfc.nasa.gov/public/cspub.htm">http://library.gsfc.nasa.gov/public/cspub.htm</a>   |
| APPEL Case Studies  | <a href="http://www.nasa.gov/offices/oc/e/appe/knowledge/publications/32.html">http://www.nasa.gov/offices/oc/e/appe/knowledge/publications/32.html</a>                               |
| Masters Forums video and PM Challenge video clips and podcasts                              | <a href="http://www.nasa.gov/offices/oc/e/appe/knowledge/multimedia/multimedia.html">http://www.nasa.gov/offices/oc/e/appe/knowledge/multimedia/multimedia.html</a>                   |
| PBMA Safety Messages  | <a href="http://pbma.nasa.gov/index.php?fuseaction=pbma.main&amp;cid=584">http://pbma.nasa.gov/index.php?fuseaction=pbma.main&amp;cid=584</a>   |
| Systems Engineering Leadership Development Program  | <a href="http://www.nasa.gov/offices/oc/e/appe/seldp/index.html">http://www.nasa.gov/offices/oc/e/appe/seldp/index.html</a>   |
| PBMA Video Nuggets  | <a href="http://pbma.nasa.gov/index.php?fuseaction=videolibrary.results">http://pbma.nasa.gov/index.php?fuseaction=videolibrary.results</a>   |
| PBMA Case Studies   | <a href="http://pbma.nasa.gov/index.php?fuseaction=casestudies.main&amp;cid=511">http://pbma.nasa.gov/index.php?fuseaction=casestudies.main&amp;cid=511</a>                           |
| CxP ICE Case Studies*   | <a href="https://ice.exploration.nasa.gov/ice/site/km/cs/">https://ice.exploration.nasa.gov/ice/site/km/cs/</a>   |
| NASA Incident Reporting Information System*   | <a href="https://nasa.ex3host.com/iris/newmenu/login.asp">https://nasa.ex3host.com/iris/newmenu/login.asp</a>   |
| NSC Mishap Alert Cases  | <a href="http://nsc.nasa.gov/MISO.mvc/Mwar">http://nsc.nasa.gov/MISO.mvc/Mwar</a>   |
| NSC System Failure Cases Studies  | <a href="http://nsc.nasa.gov/KMO.mvc/SFCS">http://nsc.nasa.gov/KMO.mvc/SFCS</a>   |
| NSC Cases of Interest   | <a href="http://nsc.nasa.gov/KMO.mvc/COI">http://nsc.nasa.gov/KMO.mvc/COI</a>   |
| NESC Reports  | <a href="http://www.nasa.gov/offices/nesc/reports/index.html">http://www.nasa.gov/offices/nesc/reports/index.html</a>   |
| SMA Technical Excellence Program  | <a href="http://nsc.nasa.gov/TEO.mvc/STEP/">http://nsc.nasa.gov/TEO.mvc/STEP/</a>   |
| NESC Technical Bulletins  | <a href="http://www.nasa.gov/offices/nesc/technicalbulletins/index.html">http://www.nasa.gov/offices/nesc/technicalbulletins/index.html</a>   |
| NESC Special Features   | <a href="http://www.nasa.gov/offices/nesc/home/index.html">http://www.nasa.gov/offices/nesc/home/index.html</a>   |
| NESC Online Courses   | <a href="http://www.nescacademy.org/catalog/current_courses.aspx">http://www.nescacademy.org/catalog/current_courses.aspx</a>   |
| JSC Knowledge Case Files  | <a href="https://lldb.jsc.nasa.gov/index.cfm?event=CaseFiles">https://lldb.jsc.nasa.gov/index.cfm?event=CaseFiles</a>   |
| NASA Lessons Learned Information System   | <a href="http://nen.nasa.gov/portal/site/llis/LL">http://nen.nasa.gov/portal/site/llis/LL</a>   |
| GSFC Case Development Methodology   | <a href="http://www.nasa.gov/centers/goddard/about/organizations/OCKO/casestudies/index.html">http://www.nasa.gov/centers/goddard/about/organizations/OCKO/casestudies/index.html</a> |
| “Design, Development, Test and Evaluation Considerations for Human Rated Spacecraft Systems | <a href="http://ntrs.nasa.gov/">http://ntrs.nasa.gov/</a>   |
| Human Spaceflight Lessons Learned in the “Apollo Experience Report” collection.             | <a href="http://ntrs.nasa.gov">http://ntrs.nasa.gov</a>   |
| JSC Engineering Academy   | <a href="http://ea.jsc.nasa.gov/Ea_web/html/emplsrv/academy/index.asp">http://ea.jsc.nasa.gov/Ea_web/html/emplsrv/academy/index.asp</a>   |
| US Air Force Center for Systems Engineering Case Studies                                    | <a href="http://www.afit.edu/cse/cases.cfm">http://www.afit.edu/cse/cases.cfm</a>   |
| US Space and Rocket Center Archives   | <a href="http://www.ussrc.uah.edu/">http://www.ussrc.uah.edu/</a>   |

*Table 1.* This list of existing sources of lessons learned and case studies provides an overview of what is available today for all NASA employees inside the NASA firewall. (\* Note that these links are not directly accessible without a password.)

Attachment 1  
Description of Formal Knowledge Sharing Activities

NASA's Academy for Program/Project and Engineering Leadership (APPEL): APPEL develops the Agency's technical workforce through a competency-based model that identifies learning experiences and activities that need to take place at each career level. APPEL provides leadership, advice, direction, and support to meet the learning and development objectives of the NASA program/project managements and engineering community. The Academy facilitates dissemination of lessons learned and best practices through knowledge sharing activities, including conferences, forums, workshops, publications, case studies, and communities of practice.

NASA Engineering Safety Center (NESC) Academy: The NESC Academy was established to ensure that the vast body of knowledge of retiring NASA scientists and engineers remains viable and accessible to the current community of NASA professionals. The NESC Academy provides the forum through which teams of technical experts, called Technical Discipline Teams (TDT), led by a Technical Fellow (TF), can teach the critical competencies required to meet the NASA mandate. Experienced senior scientists and engineers guide the next generation of NASA scientists and engineers in developing and refining their technical expertise and problem-resolution skills. Hundreds of years of experience--literally--are represented by the TFs and TDTs, Agency-wide, who offer courses such as Flight Sciences; Fluids and Life Support; Satellite Attitude Control Systems; Human Factors; Human Flight Operations; Materials; Mechanical Analysis; Mechanical Systems; Nondestructive Evaluation; Power and Avionics; Propulsion; Robotic Flight Operations; Software; Structures; and Systems Engineering.

NASA Safety Center Safety and Mission Assurance (SMA) Technical Excellence Program (STEP): STEP is NASA's discipline focused, career-oriented, professional development path for individuals working SMA disciplines. Participants hone their skills by first completing a series of SMA implementation/core/domain courses followed by emersion in discipline specific course work, emersion in relevant case study-based group activities, and hands-on rotational assignments side-by-side with experienced senior technical experts. The Technical Excellence Office at the NASA Safety Center works with representatives from the NASA Centers to build curricula that are doable and relevant to the SMA community.

NASA Incident Reporting Information System (IRIS): The IRIS is the Agency's repository for collecting mishap and close call data. Employees may enter incidents into the system using the "Quick Incident" feature. These will be followed up by inputs from supervisors and/or safety and health professionals at each of the Centers. Specific individuals at each of the Centers have been authorized to view cases that have occurred across the Agency and can share these locally, as appropriate.

Program Management (PM) Challenge: PM Challenge is one of NASA's premier training events. It brings together the best speakers, discussion panels, case studies, and networking opportunities in program/project management, systems engineering, safety and mission

assurance, team building, business management, and many others. PM Challenge is sponsored by APPEL in association with OSMA.

APPEL's Masters with Masters: "Masters with Masters" is a series of Web-based learning videos that brings together two NASA experts to share insights, lessons learned, and best practices. Its primary objectives are: 1) to help create a cohesive community of project management and engineering practitioners across NASA; 2) to enhance NASA's ability to function as a learning organization that cultivates reflective practice; and 3) to extend the sharing of lessons learned and best practices across borders (organizational, sectoral, and geographic). The emphasis is on storytelling in an informal atmosphere that encourages candid discussion and reflection.

APPEL's ASK Magazine: *ASK Magazine* grew out of the Academy and its Knowledge Sharing Initiative, designed for program/project managers and engineers to share expertise and lessons learned with fellow practitioners across the Agency. *ASK* includes articles about meeting the technical and managerial demands of complex projects, as well as insights into organizational knowledge, learning, collaboration, performance measurement and evaluation, and scheduling. *ASK* shares stories recounting the real-life experiences of practitioners and communicates important practical wisdom and best practices that readers can apply to their own projects and environments. By telling their stories, NASA managers, scientists, and engineers share valuable experience-based knowledge and foster a community of reflective practitioners. The stories that appear in *ASK* are written by the "best of the best" project managers and engineers, primarily from NASA, but also from other government agencies, academia, and industry.

OSMA Safety Messages: The OSMA safety message archive contains the monthly safety presentation along with a case study and other related media. These stories are written as summaries of system failures from which we can all learn. While many of these cases are not NASA related, each has certain aspects that are applicable to NASA.

JSC Today: JSC Today is a daily e-mail notification service designed as a management tool to provide time-sensitive news and information of an official nature which affects or applies to a majority of JSC employees. Any JSC organization or employee may contribute; however, only those submissions that meet certain requirements will be considered for publication. Special advisories from Center Management or NASA Headquarters are provided through JSC Special Notices and Headquarters Special Notices, respectively.

Systems Engineering Leadership Development Program (SELDP): SELDP provides a year-long training experience where home and assignment Center advocates and engineering directors share their knowledge and expertise to provide oversight and guidance to participants on assignments, training, and development options and strategies. Lessons learned are communicated by NASA engineering leadership who engage in frequent discussions with participants during workshops throughout the year. Industry and other government agency systems engineering leaders are invited as speakers to share their experiences with the SELDP participants. Workshops also provide a number of opportunities for participants to share experiences and lessons learned. On assignment, participants are matched with a technical mentor who has experience in the area they are striving to learn. Participants may also have a

developmental assignment supervisor who is responsible for sharing expertise with the participant. SELDP participants all attend the PM Challenge during their developmental year and access NASA Engineering Network Lessons Learned on-line information.