NASA AEROSPACE SAFETY ADVISORY PANEL
National Aeronautics and Space Administration
Washington, DC 20546
VADM Joseph W. Dyer USN (Ret.), Chair

August 17, 2009

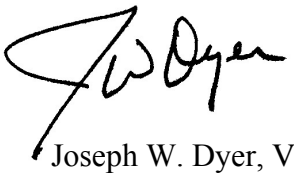
Major General Charles F. Bolden, Jr.
Administrator
National Aeronautics and Space Administration
Washington, DC 20546

Dear Gen. Bolden:

The Aerospace Safety Advisory Panel held its 2009 Third Quarterly Meeting at the Jet Propulsion Laboratory (JPL) on July 22-23, 2009. We greatly appreciate the support received from JPL subject matter experts as well as the NASA Headquarters staff who attended the meeting and provided requested information.

The Panel submits the enclosed Minutes with Recommendations resulting from this meeting for your consideration.

Sincerely,



Joseph W. Dyer, VADM, USN (Ret.)
Chair

Enclosure

Aerospace Safety Advisory Panel
2009 Third Quarterly Report
Minutes and Recommendations

Aerospace Safety Advisory Panel (ASAP)
Public Meeting
July 23, 2009
Jet Propulsion Laboratory
Pasadena, CA

ASAP Members Present

Vice Admiral Joseph W. Dyer, USN (Retired), Chair
Dr. James P. Bagian
Mr. John C. Marshall
Ms. Joyce A. McDevitt, P.E.
Mr. John C. Frost
Ms. Deborah Grubbe, P.E.

ASAP Staff and Support Personnel Present

Ms. Katherine Dakon, ASAP Executive Director
Ms. Susan Burch, ASAP Administrative Officer
Ms. Paula Burnett Frankel, Reports Editor

Attendees, Public Session

Mr. Matthew Landano, JPL Office of Safety and Mission Success
Mr. Frank Mortelliti, JPL Office of Environmental Health and Safety
Mr. Peter Robles, Jr., JPL NASA Management Office
Mr. Robert Democh, JPL NASA Management Office
Mr. Helmut Partma, JPL Office of Safety and Mission Success
Mr. Rod Zieger, JPL Project Support Office

OPENING REMARKS

The Aerospace Safety Advisory Panel (ASAP) held the public session of its 2009 third quarterly meeting at the Jet Propulsion Laboratory (JPL) in Pasadena, CA. Admiral Joseph Dyer opened the session by noting several absent panel members, including General Charles Bolden, who has been with the Panel for the past two and a half years. General Bolden is leaving the Panel to take up his responsibilities as the new Administrator of NASA. He comes with tremendous experience and background: an astronaut with close personal experience with the Hubble Space Telescope, a friend to human spaceflight as well as science and applications, and a retired Marine Corps General. Admiral Dyer also noted that Mr. Christopher Scolese has been husbanding the organization as acting Administrator after Dr. Michael Griffin's departure and prior to the appointment of General Bolden. He is a technical expert and an outstanding

communicator. Mr. Scolese has done an excellent job of ensuring continuity for the next Administrator, and the Panel owes him a special debt of gratitude.

Admiral Dyer commented that this is an interesting time for NASA. There is a desire on behalf of many inside and outside of the agency to both understand and influence future vectors as well as a desire to revisit policies of the past. Some policies that will be challenged will be ones with which this Panel has strong feelings, such as the concept of Technical Authority and the role of Center Directors, organizational structure and checks and balances, budgets, and a view of NASA as a confederation of ten independent Centers vis-à-vis a strong and integrated union. All of these will be topics of import with the new Administration, and they all directly relate to safety. Admiral Dyer stressed that the Panel's spectrum of interest remains broad and includes all of these topics.

OVERVIEW OF JPL

The Panel spent the previous day in fact-finding discussions with JPL and NASA Headquarters representatives. Admiral Dyer reported on the discussions with the Director of JPL, Dr. Charles Elachi, who provided a broad overview of the institution. Dr. Elachi opened his talk with the Panel by making an important point with regard to safety—he was a bit late for the meeting, but was careful not to speed for many reasons. He emphasized that the leadership must set the tenor with respect to safety.

JPL was established in the 1940's, born out of the California Institute of Technology (CalTech). It was moved out of town because of concerns with its explosive activities. JPL is a Federally Funded Research and Development Center (FFRDC), which gives it more flexibility in terms of salaries, competition, and operating situations than other NASA institutions, such as the Ames Research Center in the San Francisco area. JPL has about 5000 people, all of whom are CalTech employees, and a business base of $1.7 billion. Seventy-two percent of its base is in science, and it probably houses the most impressive knowledge of Mars anywhere. Currently, JPL has some nineteen spacecraft flying, a record that is representative of more activity in space and longer survivability. The benchmark for survivability would be Voyager, currently in its twenty-fourth year. JPL is organized in a matrix form, both in terms of programs as well as competencies. This organization demonstrates a great answer to the question of how to maintain balance in both perspectives, relying heavily on the rotation of people. Today, there is very little propulsion work at JPL, but there is a considerable amount of robotics work, perhaps the most impressive the Panel has seen. Admiral Dyer noted that the ASAP has had an outspoken history of concern about the compartmentalization of robotics to science, separate and apart from human spaceflight. A significant contribution to safety can be made by a better integration of human spaceflight and robotics.

With respect to JPL's physical infrastructure, the Panel felt that while not perfect, it is in far better condition than at most Centers. Overall, JPL is an impressive facility.

Dr. Elachi told the panel that he would like to see a change in the NASA governance model as it applies to centers that manage smaller projects that do not involve multiple

center responsibilities. He believes that both Project responsibility and Technical Authority for such projects should reside at the Center Director level. He felt that this would clarify lines of responsibility. The Panel has previously supported the existing NASA concept of Technical Authority not being blended with Project responsibility at the Center level. This is one way to ensure that Technical Authority decisions are not unduly influenced by the schedule and cost pressures that a Project naturally faces. The Panel has not been presented evidence altering this position.

OVERVIEW OF THE OFFICE OF SAFETY AND MISSION SUCCESS AND THE STATUS OF ENVIRONMENTAL HEALTH AND SAFETY

Ms. Deborah Grubbe reported on the Panel's observations on the presentations from and discussions with Mr. Matthew Landano from JPL's Office of Safety and Mission Success. She noted that her comments pertained to this topic as well as the Panel's discussion with Mr. Frank Mortelliti on the status of JPL's Environmental Health and Safety.

JPL continues to have a good safety performance. Based on the Panel's last visit in 2004 and observations and discussions the previous day, JPL has maintained a good safety record. However, the Panel believes that the challenge for JPL going forward is a question of how good it really wants to be in safety, because it possesses the capability to be much better. The JPL safety culture can be improved, and it must start with a renewed commitment from JPL's leadership—it should clearly express the challenge and its commitment to it to the workforce. (Recommendation 2009-03-01a cites some specific actions.)

There have been some very good conversations with regard to hazards, but they can be better—they can be more certain and definitive for people. There have been warning signals, one of which the Panel observed during its tour: employees wearing open-toe shoes when there might be a possibility of their venture into a potentially hazardous area. With a good safety performance, more attention can be placed on issues associated with making aging workers more productive. Some excellent work has been done in this area on a volunteer basis—volunteer, because it requires the human individual to make changes to lifestyle. A good initiative to start with would be one that focuses on specific issues inside JPL. Ms. Grubbe indicated that the Panel would be happy to provide more details to JPL privately if desired. The question Ms. Grubbe posed was: You can be great—do you want to be?

Mr. John Marshall noted that another issue is better integration with the new NASA Safety Center (NSC) at the Glenn Research Center. It is a resource that can be of great use to JPL and vice versa. He encouraged and recommended that JPL establish a better working relationship with this organization and capitalize on the NSC's strengths and experience.

Mr. John Frost commented that the JPL safety representatives are top notch and seem to have exceptional credibility with the programs that they support. One of the reasons that

this is true is because of the encouragement of personnel exchange between the project side and the support side of the matrix. This exchange is working and is something the Panel would like to see more of at the other Centers. Also, JPL has a good closed loop system for taking lessons learned from flight or ground anomalies and ensuring that they are tracked and put into a system. There are two areas that the Panel has commented upon previously: the risk acceptance process and lessons-learned/golden rules standardization. Mr. Frost noted that Panel has seen some weakness in these areas at many NASA Centers and again sees it here. He recommended that JPL strengthen its risk acceptance process by clearly identifying the individuals who accept the various risks. The Panel continues to recommend better coordination Agency-wide on lessons-learned and the sharing/standardization of golden rules.

METRICS AND REPORTING

Ms. Joyce McDevitt summarized the Panel's review of Metrics and Reporting and the discussion with Ms. Faith Chandler, the NASA Headquarters Mishap Investigation Program Manager. All of the discussion dealt with responding to recommendations made by the Panel at previous meetings: to improve on the quality of the accident investigation; to ensure more timely investigation results and more timely final authorization of the Mishap Investigation Board Report by NASA Headquarters for a broader release across the Agency; and to improve the capture of lessons learned. There was a discussion addressing the various initiatives in the area of mishap investigations. One of the key things that has improved the strategy for dealing with mishaps and reporting on investigation results is that Ms. Chandler now reports monthly to the Baseline Performance Review (BPR), which is a senior management committee; the reporting to senior management is the result of a previous ASAP recommendation. The BPR is directed by the Associate Administrator, and includes the Associate Administrators for the various Mission Directorates and Center Directors or their representatives, and focuses on addressing institutional issues. The BPR has resulted in more emphasis being given to the area of mishaps and reporting as well as the flow of the process down through the Centers. The Panel looks forward to continued progress in this area.

Some of the initiatives underway are: the Incident Reporting Information System (IRIS) and the use of that system by all Centers; the Interim Response Team activities to ensure that evidence is impounded, debris collected, etc., prior to establishment of the Mishap Investigation Board (MIB); and root cause analysis. The Panel was pleased to hear of the March 2009 beta release of the root cause analysis software to NASA civil servants. The full roll out is expected to occur in October 2009 to all contractors and Agency representatives. This tool is helpful in looking across all of the analysis performed in conducting the investigation. Recognizing the requirement within the Agency to use trained investigators, there is a continuing effort to train people both in the safety community and those in specific discipline areas. To facilitate the mishap investigation process, three Mission Support Specialists from the NSC are available to assist in the Type A and Type B mishaps. When the MIB convenes, they now have a trained facilitator and are able to step out promptly to perform their investigative activities.

In completing the MIB activity in a timely fashion, a couple of noteworthy things have been accomplished. A Mishap Warning Action Response (WAR) has been developed. This provides early findings and recommendations, with results posted on a web site. In the past, the ASAP has been concerned that mishap information was not getting out across the Agency as quickly as possible. The Mishap WAR process addresses that concern, but still is solely dependent upon the accident board to determine if agency-wide information is necessary instead of NASA's SM&A leadership making that determination. There was also concern about the quality of the mishap reports, and the NSC is now taking on an initiative to perform a peer review of this area. Also, the additional resources provided by the NSC are freeing up some of the backlog activities. With respect to this backlog, a prioritization has been established for tracking corrective action closure. Those mishaps that affect programmatic missions and multiple injuries are worked on first, followed by the rest of the backlog of corrective action reports. This was one area that the Panel had previously expressed concern about—the timeliness for getting the final authorization of the report through the various offices at NASA Headquarters. The ASAP did not receive any particular metrics or statistics in this area. The Panel requested Ms. Chandler and her staff to pull the data in this area together and provide it to the Panel to determine whether the trending is in the right direction.

Admiral Dyer added that the tracking and trending of administrative turnaround of reports at NASA Headquarters was fundamentally conspicuous in its absence and needs to be fixed. Another concern was capturing in-flight anomalies. This area has not been addressed with regard to gathering the metrics, but there is an effort underway to utilize the root cause analysis tool to improve on the investigation of in-flight failures and anomalies that lead to mission failure.

Mr. Frost noted that it is NASA policy to fully track to closure the recommendations stemming from investigation of unmanned system flight anomalies that meet the criteria of mishap (i.e. mission failure). This is a good closed loop system for these safety investigations; however, it is not clear if such a system is being utilized to identify and track to closure the programmatic and systemic root causes of less severe flight anomalies that are investigated by technical boards that are not part of the mishap investigation process. The panel has noted several excellent flight anomaly investigations in the past whose recommendations seem not to have been fully implemented as new standards or procedures. The Panel would like to be briefed at a future session by the Chief Engineer's Office on how programmatic or systemic root causes are identified and recommendations tracked to closure for technical boards of investigations that are not part of the mishap investigation process.

The Panel was presented with several charts depicting the current results of data analysis efforts. This area is evolving. The Panel specifically asked that this report be presented quarterly because there is a continuing, overriding question of how to make the safety program better. The ASAP is committed to help NASA identify leading indicators and having this data analysis supports that initiative.

Ms. Grubbe commented on Dr. Elachi's statement that he worries most about human error and loss of experienced people. Considering the leading indicators, the data base should grow to include the "people aspects" at some point in the future.

Ms. McDevitt indicated that one of the areas NASA Headquarters is going to be examining is mishaps with cost as the common denominator to see what information that might convey. The Panel was shown more than merely a number count—there was a normalization of data based on the number of work hours per Center, for example, and this showed results in a more meaningful way. Telling messages can be derived from this data. The Panel encouraged NASA to continue its work in this area, and expects reviews periodically. Dr. Jim Bagian added that one of the important aspects is how NASA looks at the data and understands the true underlying causes as well as the more generalized learning that can be achieved throughout the Agency.

Admiral Dyer reiterated Ms. McDevitt's laudatory comments. He noted a follow up action: a chart based on the Panel's previous recommendation regarding administrative approval time.

OBSERVATIONS ON JPL TOUR

Before Mr. Marshall gave his report on the JPL tour, Admiral Dyer thanked him for his representation of the Panel in testifying to the Science Committee on the Hill a few weeks ago.

Mr. Marshall shared some feedback from the ASAP's tour at JPL. He noted that the Panel has taken on the issue of utilization and integration of robotics in support of both science and exploration. The very impressive field demonstration was more confirmation of JPL's great skill in robotics. This happens because of good leadership and enthusiastic performance of people. The Panel was given a demonstration of the Axel Rover robotic concept and received a briefing about its capabilities for utilization in exploration. On behalf of the Panel, Mr. Marshal gave compliments to all involved. After the Axel field demonstration, the Panel had a conversation with JPL about the Spirit and Opportunity rovers on Mars. Their success has been tremendous. A rover designed for a three month lifetime has gone five years. This is a credit to leadership and the people involved in the program.

Regarding the integration of robotics in NASA in general, Mr. Marshall noted that the Panel continues to be disappointed—it continues to see a lack of integration both among Centers developing robot capability and across the full spectrum of manned and unmanned exploration. Most Centers have some robotic activity because they want to be "in the game." Accordingly, the Panel concludes that this contributes to a loss of momentum and loss of opportunity and recommends that NASA pursue robotics research in a coordinated, consolidated fashion to capitalize on the strengths that have been developed and more fully exploit robotics utilization throughout all missions.

Ms. Grubbe added that one of the positive steps with regard to integration is the people-sharing going on between JPL and the Constellation program. Currently, seventy-nine people are involved. This is positive progress, but what is needed is something that is overarching and can accelerate the collaboration.

STATUS OF COMMERCIAL ORBITAL TRANSPORTATION SERVICES (COTS)

Mr. Frost reviewed the Panel's discussion with Mr. Alan Lindenmoyer, the Manager of the Commercial Crew and Cargo Program Office, who came to JPL to talk about the COTS Program. It is emerging as one of the critical programs for NASA. The Panel had assumed that Constellation would be the immediate path to the future of Human flight for the Agency; however, there may or may not be a widening of the gap between the end of Shuttle flights and the beginning of Constellation services. If there is a widening gap, COTS could play a key role and could be a critical program for flight safety of the astronauts. This warrants greatly increased attention on the processes of ensuring the safety of COTS systems.

There are two phases to the current COTS ISS cargo program: a demonstration phase of $500 million, followed by a competitive procurement planned to proceed only after a successful capability demonstration. For reasons not completely clear to the Panel, the timeline for the two phases has been compressed, and both are now proceeding simultaneously. Orbital Sciences Corporation (OSC) and SpaceX have both been funded to perform both phases 1 and 2. Although Phase 1 is not complete, Phase 2 contracts have been awarded for about $3.5 billion. The two organizations have distinctly different ways of approaching the complex job of getting mass to orbit. The compression of the program (to do Phase 2 before Phase 1 is complete) entails programmatic risk and is of concern to the Panel. Adding to this concern, one of the contractors will demonstrate all of its capability in a single test flight, in effect "putting all of its eggs in one basket".

As far as the safety issues, they basically boil down to expanding the cargo capability to include crew. If that is done, the traditional method would be to apply full human rating criteria initially at the beginning of the program's development. However, thus far NASA has consciously chosen to not use a traditional approach, and there yet have been any performance requirements identified to put crews on board a COTS vehicle. The Panel previously had made a recommendation regarding this issue and continues to be perplexed as to why NASA has delayed this important action. Mr. Frost noted that the Panel has a meeting with SpaceX at its facility later in the day and has a lot to learn about the entire process. Nevertheless, the Panel continues to recommend that the Agency quickly establish fundamental safety requirements for today's COTS programs that may in the future be used to get NASA's astronauts to Low Earth Orbit (LEO), or beyond.

Admiral Dyer indicated that the Panel was looking forward to the SpaceX visit. The Panel has addressed its concern in its previous quarterly and annual reports. The issue is becoming more focused and more urgent. The prospect of a COTS delivery of cargo to space is organizationally and politically simpler than crew transport. The issue of human rating with COTS and the delivery of NASA astronauts into space is the primary concern.

Admiral Dyer noted that the Panel remains concerned that in the probing of this question, NASA looks to the FAA, which doesn't have the institutional history and people to speak clearly to the topic. This issue represents an opportunity for improved interagency performance.

REPORT ON JPL ROBOTICS SUPPORT OF HUMAN SPACEFLIGHT

Dr. Bagian reported on the Panel's review and discussion of JPL Robotics Support. It is clear that JPL has been integrated and is working collaboratively with other NASA Centers and the Exploration Program. This is a good thing. As JPL is organized, the matrix approach is a way to make good use of appropriate resources. JPL leads two exploration programs--Advanced Environmental Monitoring and Control, and testing for Autonomous Landing and Hazard Avoidance. These are in keeping with their past experience on the Mars program and other remote probes. For robotics in support of human spaceflight, there are three basic areas: stand-alone, precursor for human activities, and systems embedded in the human infrastructure. This categorization of functions makes sense to the Panel. A specific example that was given was lunar and Mars experiences with ATHLETE and tri-ATHLETE. The Panel was impressed with models on how to deploy the habitat without man-suited activity. There was some discussion with Mr. Wilcox about designing this system to be teleoperated on for the Moon mission rather than being autonomous as will be required on an eventual Mars mission. The Panel found this somewhat curious. If the Moon mission is meant to be in preparation for a Mars mission, shouldn't we be practicing the technology and procedures that we will need for that ultimate mission. Mr. Frost mentioned that in the military that is known as "training like you will fight". Admiral Dyer emphasized that this was not a criticism, but rather is a programmatic question.

Mr. Frost pointed out that this question illustrates the theme that the Panel has iterated repeatedly. It is critical to know the mission in order to design the hardware. If we don't know why we are going to the moon, we won't know how to design the hardware properly for whatever the mission is. Teleoperation on the moon makes sense if we are trying to do the lunar operations in the simplest way; however, if we are practicing on the moon for a future Mars mission, we should be demonstrating and improving the autonomous operations that will be needed in the next phase.

Admiral Dyer noted that this is also the issue with COTS. If the vehicle is being designed to be a cargo hauler, that is a different mission and a different set of designs than a crew transporter.

Mr. Frost added that the human rating requirements for the Agency are built around the design process and those processes are ongoing now at the COTS contractors. It would be problematic to come back later to put these requirements into a process that is already complete.

CONCLUDING REMARKS

After stating that the ASAP public hearing was complete at this point, Admiral Dyer commented on an interesting discussion on risk that the Panel had earlier that morning. He asked everyone at the meeting to think about the time of innovation in the aviation business in the 1930's. It was the era of Reno Air Races and Air Mail Delivery. It was a risky business with associated loss, but it was a great leap forward. Anchor one end of the risk continuum with this 'Air Mail' era, and anchor the other end with the Shuttle era, where perfection is not only expected but demanded in what is essentially a zero failure tolerant business. In terms of the attitude on risk management, there is a lot of space between the two ends of that continuum, and probably neither end is where NASA really should be operating.

One of the things the panel discussed extensively is that in going forward with exploration, the shouldering of risk needs to be undertaken not only by NASA but by the Congress and the White House and communicated to the public. For NASA to go into the future with the Agency alone shouldering the risk does the nation a disservice and is disingenuous to the public. Admiral Dyer commented on U.S. naval aviation and operations from aircraft carriers. Each year, we lose about a dozen people, but because it is important business, we shoulder that risk and move forward. Space exploration is just as dangerous, and we are fortunate to have courageous people willing to accept the risk.

With respect to this aspect, Dr. Bagian noted that the issue also is NASA's ability to be candid with the public, and that the public fully understands what risk is involved. There is no shortage of well-qualified people that are willing to take the risk. There can never be a zero level of risk. The rate of progress can be limited by the amount of risk one is willing to take. He opined that the pendulum may have swung very far to one side in assuming that there should be no risk. Most importantly, the "risk conversation" should be more transparent to everyone. The human rating requirement is in process, but it doesn't say "how safe is safe" or what that number should be, and it needs to. The longer NASA delays the decision on the safety requirements for COTS, the more the eventual system will suffer in safety, cost or schedule.

With regard to communication from the lower ranks to the upper ranks within the Agency, Admiral Dyer noted that the Panel has seen a very positive shift in the culture of NASA. People are not only allowed and encouraged to voice concerns, but are appreciated for doing so. There has been tremendous progress in this regard. Flight readiness reviews have shown that voices get heard and NASA has been doing a much better job. This progress contrasts with something that hasn't changed—how NASA communicates to the public and perhaps to Congress. This communication doesn't reflect the same positive evolution. The plainspoken nature of the in-house technical NASA is out of harmony with the Agency's communications to the public and its congressional relations. Admiral Dyer tied this back to what had been stated earlier regarding the shouldering of risk among NASA, Congress, and the White House. He recommended an evolution in external communications. Ms. Grubbe added that NASA has a role to educate and help society with technical learning and development. So much of this is in the context of what is going on at the moment when the decision is made. It

is sometimes difficult to extricate out of the present and make a good decision for the future, and even more difficult to stick to that decision year after year.

With respect to communications, Dr. Bagian commented that one of his concerns is the lack of the same candor and openness to the extramural community as is seen in NASA's intramural community. There is an obvious dissonance between the external and internal message, and what is said externally inhibits people from speaking up internally. This dissonant message has an impact, although it is hard to document or quantify.

Ms. Grubbe opined that the lack of "proactiveness" on the part of NASA's communications office has allowed detractors to define NASA in the public domain, and this is worrisome. Mr. Frost noted that one of the serious consequences of a failure under these circumstances could result in a stand-down for several years. This would be tragic for the exploration program. One cannot undertake great enterprises of great risk and be surprised when there are issues en route.

Before adjourning the meeting, Admiral Dyer thanked JPL again for its hospitality and reiterated how impressed the Panel was with what it had heard and seen.

ASAP RECOMMENDATIONS, THIRD QUARTER, 2009

2009-03-01: JPL Safety Performance

2009-03-01a: In order for JPL's leadership to improve their current excellent safety record even further, we recommend that:

1. The leadership express that challenge and their commitment to this to their workforce
2. Working with middle management and others – develop an action plan that implements improvements using an approach similar to the "continuous improvement process" used in manufacturing (often called the "lean" process or the DMAIC process)
3. Track progress using explicit metrics that are periodically published to the workforce and implement further corrective actions as needed.

2009-03-01b: The new NASA Safety Center (NSC) at the Glenn Research Center is a resource that can be of great use to JPL and vice versa. The ASAP recommends JPL establish a closer working relationship with this organization and capitalize on its strengths and experience.

2009-03-02: JPL Risk Assessment Process

2009-03-02: JPL appears to have a well organized process for tracking potential safety risks and eventually making informed decisions about their acceptability based on wide coordination and reviews by various committees. A further improvement to that process would be the clarification of the individuals who in fact make the final formal decisions. Recommend that the process be expanded to include a formal risk acceptance document signed by the authority designated with that responsibility in accordance with the risk level presented by the risk.

2009-03-03: Metrics on MIB Report Authorization and Release from NASA HQ

2009-03-03: There is continuing concern about the tracking and trending of administrative turnaround of reports at NASA Headquarters—specifically, the timeliness of getting the final authorization of the MIB report through the various offices at NASA Headquarters. The ASAP did not receive any particular metrics or statistics in this area. The Panel recommends that the NASA Headquarters Mishap Investigation Office continue to pull the data in this area together to determine whether the trend is in the right direction. A chart should be presented to the ASAP at the next meeting. A quarterly report on this topic is requested.

2009-03-04: Integration of Robotics

2009-03-04: The Panel continues to be disappointed in what it sees as a lack of integration of robotics across NASA. Most Centers have some robotic activity because they want to be "in the game." There appears to be a loss of momentum and opportunity in this area. The Agency needs examine the benefits of developing a consolidated and integrated robotics research program to capitalize on the numerous independent programs that have been developed and more fully exploit robotics utilization throughout all missions.

2009-03-05: Human Rated Requirements (HRR) Technical Standards

2009-03-05: The Panel reiterates its previous recommendation 2009-01-01-- "ASAP recommends that NASA formally establish and stipulate the direct link between the HRR and the applicable NASA standards, such as the NASA-STD-5000 series of engineering directives as well as relevant technical standards," and 2009-01-02--"The ASAP recommends that NASA stipulate directly the HRR acceptable risk levels including confidence intervals for the various categories of activities (e.g., cargo flights, human flights) to guide managers and engineers in evaluating 'how safe is safe enough.' These risk values should then be shared with other organizations [COTS] that might be considering the creation of human-rated transport systems so that they are aware of the criteria to be applied when transporting NASA personnel in space."

2009-03-06: Human Rated Requirements (HRR) for COTS

2009-03-06: Recent events make it likely that use of commercial vehicles to transport NASA crews to LEO will occur much sooner than most had planned. While the Panel recognizes that authority and direction to proceed in this direction has not yet been formally given to NASA, it also recognizes that systems to meet this need are already under development by COTS vendors. If these systems are ever to provide the level of safety expected for NASA crews, it is imperative that NASA's criteria for safe design of such systems be agreed upon and provided to such COTS enterprises. This issue is becoming more focused and more urgent. Human rating of COTS for the delivery of NASA astronauts into space is now one of the Panel's primary concerns. Recommend that COTS HR requirements be established as soon as possible and promulgated to those that seek to design systems for this future mission.

2009-03-07: NASA External Communications

2009-03-07: With respect to internal NASA communications, the Panel has seen a very positive shift in the culture of NASA. People are not only allowed and encouraged to voice concerns, but are appreciated for doing so. There has been tremendous progress in this regard. Flight readiness reviews have shown that voices get heard and NASA has

been doing a much better job. This progress contrasts with something that hasn't changed—how NASA communicates to the public and perhaps to Congress. This communication doesn't reflect the same positive evolution. The plainspoken nature of the in-house technical NASA is out of harmony with its communications to the public and its congressional relations. The Panel recommends an evolution in external communications commensurate with that achieved in its internal communications.