

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

February 3, 2009

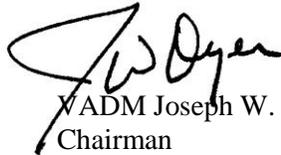
Mr. Christopher J. Scolese
Acting Administrator
National Aeronautics and Space Administration
Washington, DC 20546

Dear Mr. Scolese:

Enclosed are the Aerospace Safety Advisory Panel (ASAP) comments to NASA's responses dated, December 12, 2008, to 15 of the recommendations from the ASAP's 2008 First, Second, and Third Quarterly Meetings. The ASAP's concern relating to tracking number 2008-02-04 to formulate a decision tree for optimizing the use of robotics in exploration was addressed to you in a separate ASAP letter dated January 21, 2009.

I look forward to discussing these and other issues with you in the future.

Sincerely,

A handwritten signature in black ink, appearing to read 'J. W. Dyer', written over a horizontal line.

VADM Joseph W. Dyer, USN (Ret.)
Chairman
Aerospace Safety Advisory Panel

Enclosure

1. Recommendation 2008-01-02, Orion: NASA's approach to risk both at a macro and a more detailed level

ASAP Comments: The Aerospace Safety Advisory Panel (ASAP) is pleased with the NASA response to this ASAP recommendation and with the approach that the Agency is taking. Because the ASAP is not familiar with the Windchill tool, the Panel requests that NASA provide a short demonstration during the ASAP second quarterly meeting at the Johnson Space Center (JSC) in April 2009 to show, for example, data relating to the Orion mass scrub risk assessments.

ASAP Status of Recommendation: Closed

2. Recommendation 2008-01-03, Communication of risk

ASAP Comments: The ASAP is pleased that NASA has an established plan for the proactive development and communication of risks associated with exploration systems and the Constellation Program, as documented, respectively, in ESMD-RMP-04 06, Rev. 2, Exploration Systems Risk Management Plan, and CxP 70056, Constellation Program Risk Management Plan. NASA's internal processes relating to risk management and communications reflect a systematic and disciplined approach. Of particular interest to the Panel is whether the risks and risk assessments address both realistic targets of achievement and minimally acceptable risk levels as well as how failure tolerances will be communicated; the ASAP would like to address this topic in greater detail at one of our future meetings. In addition, the specific implementation of these plans to communicate with external stakeholders is of great interest, so the ASAP would very much appreciate receiving additional specific information on current planning that might be under way to communicate risks to external stakeholders. The ASAP suggests that the Exploration Systems Mission Directorate (ESMD) managers should address this topic at the ASAP first quarterly meeting in February 2009 and that Constellation Program managers should discuss this issue at the ASAP second quarterly meeting in April 2009.

ASAP Status of Recommendation: Open

3. Recommendation 2008-01-05, NASA Safety Reporting System (NSRS) benchmarking

ASAP Comments: The NASA response was very thorough in addressing the ASAP recommendation, the purpose of the 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) Web site, 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.

ASAP Status of Recommendation: Open

4. Recommendation 2008-01-06, NASA Headquarters mishap investigation

ASAP Comments: The NASA response adequately addresses the ASAP concern by specifying timelines that will ensure more timely reporting of mishap investigation results. Although the NASA response did not explicitly address the ASAP recommendation about using appropriate experts to determine root causes, the Panel noted that “trained investigators” would need a minimum of 45 workdays to successfully identify root causes for Type A and Type B mishaps, thus suggesting that the mishap investigation boards must include personnel with the necessary expertise. Because a projected completion date of June 2009 is given for NASA actions, the ASAP requests that NASA conduct a follow-up briefing at the ASAP third quarterly meeting at JPL to update the status of the project and to present metrics on meeting these new deadlines, including a review of the Incident Reporting Information System and NASA Safety Center Web sites, which ASAP members cannot access. NASA should clarify Action 2e, “all mishap reports will be posted... within two work days of their completion,” to indicate whether completion refers to investigation board activity or to release of the mishap report after receipt of NASA Headquarters endorsement.

ASAP Status of Recommendation: Open

5. Recommendation 2008-02-02, NASA Golden Rules for knowledge management

ASAP Comments: The NASA response is consistent with an overriding NASA philosophy of not requiring standardization. The NASA response promotes an approach that fails to take advantage of the wealth of knowledge and lessons learned among the various programs and projects conducted by the Agency throughout its storied history. The ASAP would recommend a more robust approach that focuses on how-to information so that lessons learned are shared responsibly. The ASAP has concluded that significant elements of this approach include establishing (1) a technical guru as the single point of contact for the program (perhaps similar to the engineering fellows), (2) a NASA technical group (with Headquarters as lead) that would assess lessons learned for Agency-wide applicability and, as appropriate, would include technical gurus and Center representatives as members, and (3) more important, a culture of sharing insights and seeking knowledge in the experience of others. The idea is to widely disseminate the lessons learned (or Golden Rules, whatever term is used for shared knowledge) so that other NASA employees and groups are aware of and can apply the often hard-won knowledge. Such lessons learned are not intended to be an Agency-wide set of unbreakable rules that all must follow blindly because such an approach would be as unproductive as it would be difficult. Systems engineering really emphasizes the identification of emergent behavior associated with a previously unknown combination of factors, systems, technologies, or equipment. Systems engineers attempt to identify probability states so that they can design out any of those states that might lead to unintended consequences. Shared knowledge reduces the spectrum of the unknown and hence increases the probability of success.

ASAP Status of Recommendation: Open

6. Recommendation 2008-02-03, Modeling and simulation

ASAP Comments: The ASAP recommendation emphasized the need for some measure of conformity or standardization across all NASA Centers for determining the validity of simulated approaches. The NASA answer disagrees with the ASAP recommendation, not

because of the idea, but because of the process. The NASA approach instead substitutes a fairly complex 8x5 level score, which somehow is computed and provided. The number of permutations and combinations in the NASA approach totals 192¹ and indicates that the Agency is suggesting either that more numbers will produce a more accurate assessment or that the more complex the assessment scheme, the higher the fidelity of the answer. However, dissecting an unknown into hundreds of pieces and individually evaluating each piece does not inherently produce a more accurate answer.² In fact, each and every one of the factors and levels in the NASA score is just as arbitrary as the red-yellow-green scale that the ASAP suggested.

The ASAP cannot comment on the provided method because NASA did not furnish details. However, the important part of the recommendation is the suggestion that a mechanism should be established to provide to the decision-maker information on the validity of simulated results and on the boundaries of those valid results. The most common error in using simulated results does not stem from the inaccuracy of the model per se, but rather in trying to utilize it beyond the regions in which it applies. The ASAP would be interested in a clear, simple description of the NASA score in terms of (1) the region over which the simulation is valid and has been confirmed by other means (e.g., test, measurement); (2) the region over which, based on the assumptions, the simulation could reasonably be expected to extend; (3) the simplifying assumptions used in creating the model and their impact on accuracy; and (4) the boundary outside of which the simulation is no longer applicable at all.

Thus, regardless of the number or the complexity of computing the score of a simulation, the ASAP would expect a mechanism that clearly articulates not only the simulation's simplifying assumptions and the boundaries of the regions in which the simulations are expected to apply, but also those regions in which the simulation does not apply at all.

ASAP Status of Recommendation: Open

7. Recommendation 2008-02-05, Traffic collision avoidance system for NASA aircraft

ASAP Comments: After attending numerous Intercenter Aircraft Operations Panel (IAOP) reviews, the ASAP noted that many NASA aircraft do not have a traffic collision avoidance systems (TCAS), an enhanced ground proximity warning systems (EGPWS), or other advanced technology systems. The Federal Aviation Administration (FAA) Federal Aviation Regulations currently require the use of both TCAS and EGPWS on all commercial carriers, and the FAA highly recommends both systems for use on all other aircraft because they provide significant protection from mid-air collisions and from controlled flight into terrain. When discussing the failure to modify NASA aircraft to accommodate both systems, most Center aviation managers indicated that the problem in general lies in inadequate funding, not a failure to understand the risks that both systems mitigate.

In response to an apparent reluctance by Center aviation managers to request modification of aircraft to include either or both systems, the ASAP recommended that the Aircraft Management Division (AMD) establish a NASA-wide requirement to add TCAS and EGPWS capabilities to all aircraft that are capable of accepting these systems. Once this

¹ $[n \times (n-1)!] = 8 \times 24 = 192$ possibilities

² As noted in Augustine's Laws, the accuracy of a piece of information is inversely proportional to the number of significant figures used to express it (e.g., the number of hydrogen atoms in a water molecule is two, while NASA computed the odds of being hit by a fragment of Skylab out to 32 significant figures.

general policy is embraced, the Center aviation managers could use this policy as the basis for justifying addition of the two safety systems.

Interestingly, the NASA response to this recommendation acknowledges the value of both TCAS and EGPWS. Furthermore, the NASA response explains the plan to incorporate a policy change in NASA Policy Directive 7900.4 that requires Center aviation managers to “regularly review both systems and (*other*) procedural enhancements based on risk management.” Nevertheless, the ASAP has concluded that the NASA reply does not address the basic recommendation to develop a NASA-wide policy to equip its aircraft fleet with current safety technology and that the NASA response provides little support or incentive to Center aviation managers to ask for additional funding to support installation of these safety systems. Accordingly, the ASAP reiterates our recommendation to develop an Agency policy that requires all compatible NASA aircraft to be equipped with TCAS and EGPWS.

ASAP Status of Recommendation: Open

8. Recommendation 2008-02-06, Subjecting private charter operators to independent audits

ASAP Comments: NASA has met the intent of the ASAP recommendation by establishing a mechanism to involve the Aviation Management Office in supporting program and technical offices that issue subcontracts for aircraft operations.

ASAP Status of Recommendation: Closed

9. Recommendation 2008-02-07, Accident review timeliness

ASAP Comments: 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.

ASAP Status of Recommendation: Open

10. Recommendation 2008-02-08, NASA fall protection standard

ASAP Comments: 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.

ASAP Status of Recommendation: Open

11. Recommendation 2008-03-01, Assessment of the MSFC industrial safety program

ASAP Comments: The ASAP is pleased that the Marshall Space Flight Center (MSFC) has shared its approaches for implementing a successful industrial safety program by making presentations at annual safety and health manager meetings and by posting such briefings on the Web site for easy access and reference by other Centers. We continue to encourage NASA to promote the MSFC industrial safety program as an outstanding model that other Centers should adapt and adopt when implementing NASA and Federal occupational safety and health program policies and requirements.

ASAP Status of Recommendation: Closed

12. Recommendation 2008-03-02, Industrial safety performance metrics

ASAP Comments: 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 constitutes 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 that 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 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 other issues.

ASAP Status of Recommendation: Open

13. Recommendation 2008-03-03, Constellation approach to integration

ASAP Comments: The ASAP requests that NASA conduct a briefing at the ASAP second quarterly meeting at JSC in April 2009 to update the Panel on Constellation program integration procedures and operations. The briefing should address any changes implemented since the last Panel review, emphasizing lessons learned and anticipated problems in general,

particularly as they relate to major program milestones such as the Ares 1 Preliminary Design Review.

ASAP Status of Recommendation: Closed

14. Recommendation 2008-03-04, Base Realignment and Closure (BRAC) impact on Marshall Space Flight Center

ASAP Comments: The ASAP is extremely impressed with the level of NASA's response to the ASAP recommendation. The detail of the NASA response shows real action. The ASAP is very pleased that the Office of Human Capital Management has resubmitted in FY09 the proposed legislation to waive the salary offset for reemployed annuitants, and the Panel encourages NASA to take a similarly aggressive approach to seeking waivers of term appointment constraints. The ASAP would appreciate a briefing from NASA in early 2010 to update the status and results of these measures.

ASAP Status of Recommendation: Open

15. Recommendation 2008-03-05, Open Columbia Accident Investigation Board (CAIB) recommendations

ASAP Comments: Although the NASA response indicates that NASA accepts the risks associated with the three remaining open 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.

ASAP Status of Recommendation: Open