National Aeronautics and Space Administration

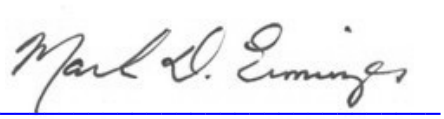
AEROSPACE SAFETY ADVISORY PANEL
PUBLIC MEETING

January 27, 2005

Florida Space Authority

Cape Canaveral, Florida

MEETING MINUTES



Mark D. Erminger
Executive Director

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

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Panel Attendees

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

Dr. Dan L. Crippen

Dr. Amy K. Donahue

Dr. Augustine O. Esogbue

Maj Gen Francis C. Gideon, Jr., USAF (Ret)

Ms. Deborah L. Grubbe

Mr. John C. Marshall

Mr. Steven B. Wallace

Mr. Rick E. Williams

Mr. Mark D. Erminger, Executive Director

Panel Members not in Attendance

BG Joseph A. Smith, U.S. Army, Ex-Officio member

Members of the public were given the opportunity to submit comments in writing to the Panel prior to the start of the meeting. No members of the public submitted any written comments.

INTRODUCTION

Vice Admiral Joseph Dyer introduced himself and welcomed the participants.

OPENING COMMENTS

Vice Admiral Dyer started out by saying that it was the one-year anniversary for the current ASAP and explained that the purpose of the meeting was to share a report of the Panel's last two and a half days at Kennedy Space Center (KSC). He asked each of the Panel members to introduce themselves. He also introduced the newest Panel member,

Dr. Amy Donahue. Dr Donahue replaced Dr. Rosemary O'Leary who recently accepted another position in the Western Pacific.

Vice Admiral Dyer provided highlights of the Panel's meetings at KSC and of the Panel's activity that has taken place since the last quarterly meeting.

Vice Admiral Dyer acknowledged the Panel's appreciation for the strong leadership that Mr. Sean O'Keefe has given NASA. Under Mr. O'Keefe's leadership several important initiatives are well on their way to completion.

Independent Technical Authority (ITA) has been the highest priority for ASAP. Specifically, ITA is used when you are confronted with an issue that requires a waiver or a deviation. ITA answers the question of whether it is safe to proceed. ITA is a process and it includes the identification of individuals as warrant holders. It is a significant cultural shift in that it transitions from functional or organizational responsibility to individual accountability with associated responsibilities and authorities. ASAP is very pleased with the progress that NASA has made with ITA, and Vice Admiral Dyer noted the strong support from Rear Admiral Walt Cantrell, who was previously a member of ASAP, in the ITA effort.

KSC OVERVIEW

After providing opening remarks, Vice Admiral Dyer addressed the first topic, which was the Panel's discussion with the KSC Center Director, Mr. Jim Kennedy.

Mr. Kennedy gave a good overview of what it takes to make KSC function. KSC has 14,000 employees: 2,000 government employees, 12,000 contractors, and a $1.6 billion contribution to the local payroll. Mr. Kennedy has certainly aligned his leadership with NASA's vision. His briefing and every briefing that the Panel attended started out with a genuine discussion of NASA's heritage. This is an indication of good culture taking strong root.

KSC senior leadership was properly focused on the Space Shuttle as the number one priority. There was a clear understanding that the activity was milestone driven and not schedule driven. In other words, schedule will not force the taking of unacceptable risk. KSC is preparing two Space Shuttles for the next flight because of the potential need for a rescue in case there is a problem with the first Space Shuttle. There is a tremendous amount of activity and people are energetically engaged but not rushing. The Panel tries to be sensitive to and perceptive of the subtle things when observing NASA activity. Expeditious but measured pace is one of the things that the Panel noted at KSC.

The International Space Station (ISS) is 40 percent complete. Modules are in place at KSC to bring the ISS to 75 percent complete. The ISS is one of the strongest examples and best case studies of logistics management.

The ASAP has a very positive report on KSC.

ITA

Mr. John Marshall discussed the Panel's review of ITA with the NASA Chief Engineer, Mr. Rex Geveden.

Mr. Marshall noted that the session was very helpful, and he applauded the continuing progress NASA has made addressing this difficult issue. As noted previously, ITA has been a top-priority of the ASAP from the time this panel began its deliberations. Of course, the review and independence of NASA's ITA process are in direct response to Columbia Accident Investigation Board (CAIB) Finding 7.5-1 to reexamine the use, utility, and vitality of ITA.

Mr. Marshall recalled that the Panel previously made two recommendations regarding ITA. In April 2004, the ASAP noted that ITA is critically important if there are to be safe and reliable operations in the missions ahead and asked the Chief Engineer to perform an analysis of ITA. A second recommendation was made in November 2004 that NASA should implement its new approach to ITA prior to the Space Shuttle's next launch. In making this recommendation, the ASAP acknowledged that a significant investment in energy and effort would be required from senior NASA leaders, but that the ASAP believed the reward would be worthy of the effort.

The ASAP noted that continued support from the NASA Administrator, whomever that may be in the future, is critical for continued progress to be made fielding this concept NASA-wide. In this regard, the ASAP gives Mr. O'Keefe a lion's share of the credit for standing up and insisting that ITA be embraced Agency-wide. Nevertheless, a challenge for the future will be to get the new Administrator on-board quickly.

Mr. Marshall addressed some of the details of the ITA program, noting that the Chief Engineer has begun the screening process to identify people across NASA who will hold the warrants. He noted that the warrants are separated into two general areas: system warrants on major programs such as the orbiter, the launch vehicle, the International Space Station, and technical warrants for disciplines such as electrical systems, environmental control, thermal protection, and power systems. Most recently, the Engineering Management Board has identified approximately 70 areas which require warrant holders; although they anticipate this number to increase to as many as 150 in the future. To fill these positions, the Chief Engineer is going through a process to determine who is the best qualified to hold the warrant authority and then assigning the warrants. So far, the Chief Engineer has identified 25 warrants and issued them to 18 people.

Mr. Marshall also reported that the ASAP identified other areas of equal importance regarding fielding an effective ITA program that requires further definition. These include identifying: specifications to be used, standards that will be needed to successfully implement the warrants, interfaces required for interagency coordination, examining the concept of the use of trusted agents, and determining how warrant holders

are expected to prioritize their day-to-day workloads. At issue is how to use warrant holders still embedded in their original organizations while sustaining their autonomy.

There was some discussion by Panel members regarding identification of the remaining warrants, an assessment as to whether NASA has focused on the right areas, the cultural changes that need to be made to embrace the revised ITA concept, and sustaining technical conscience throughout the Agency.

Like Vice Admiral Dyer, Mr. Marshall singled out one of the former ASAP members, Rear Admiral Walt Cantrell, for his vision and focus in helping NASA formalize the processes that are now being implemented across the Agency. He also noted Mr. Geveden had briefed NASA's Operations Council who endorsed the concept, updated seven out of Center Directors and their senior staffs, and recently completed a Leader-led Workshop for the initial class of warrant holders.

Many of the Panel members reaffirmed their satisfaction with the progress that NASA has made, but agreed there remains a lot of work to do in this area. All the panel members agreed that the directions NASA had chosen to pursue addressing ITA were on the mark. Finally, the Panel acknowledged that the challenge in front of NASA is to sustain the progress that they have made. In this regard, the ASAP continues to be optimistic and believes this is achievable.

Vice Admiral Dyer commented that ITA certainly brings a balance of influence between programs and functional or technical issues. He further agreed that NASA has made significant progress addressing and resolving issues dealing with ITA over the past 6 months. Finally, he noted that the ASAP is very positive about ITA.

NASA BUDGET

Dr. Austin Esogbue discussed the Panel's review of the NASA budget process.

Mr. Doug Comstock, the Acting Deputy Comptroller, discussed the budget process with the Panel. It was very heartening to learn that NASA has done as much as they possibly could to ensure that the budget process was smooth.

The Comptroller discussed the four NASA values and described how they drive everything that NASA does. The NASA budget process recognizes the importance of budget on safety, and NASA does everything possible to minimize the impact of the budget process on risk associated with their operations.

The NASA Family value is used as a vehicle to make sure that proper working relationships develop with the decision makers that impact budget.

The NASA value of Excellence makes sure that NASA institutes an appropriate budgeting process with high integrity that uses the most up to date financial management system that is technologically driven.

In the fourth value of Integrity, NASA makes every effort to create credibility with their stakeholders. NASA instituted improved systems in cost-estimating and identifying early warning signals.

It seems that NASA is ahead of the other government agencies in institutionalizing the budget process.

The ASAP felt comfortable with NASA's approach to budget.

It was very interesting to understand the dynamics between NASA, the White House, the Office of Management and Budget, and the Congress. There are several iterative processes that NASA has to go through before a final budget is approved. All of that feeds into the execution of NASA tasks. There are three stages of budgeting: formulation, justification, and execution. NASA must be fully involved to articulate their position to make sure everyone understands NASA's missions and needs.

In developing a new budget formulation, NASA makes sure that new projects are not shortchanged. NASA uses a full-cost budget process to make sure projects are balanced, defendable, and executable. It also has another dimension that involves institutional review to identify possible impacts to the NASA strategic plan. There is a formal process to identify issues that are well documented and tracked.

The ASAP is concerned about making sure that the new process that protects programs like the ITA and Safety and Mission Assurance (SMA) are safety-centric. The Panel has some degree of comfort that the budget will protect these important aspects of NASA safety-driven activities.

The ASAP felt comfortable with the process that NASA uses to manage the budget.

Vice Admiral Dyer commented that budget is certainly one of the leading indicators of the seriousness that NASA is addressing safety. It bears close watching by ASAP and the leadership but at this point in time, ASAP feels the safety initiatives are well supported and properly funded.

NASA CHANGE MANAGEMENT

Ms. Deborah Grubbe discussed how NASA manages change at the Agency level.

At the last meeting, the ASAP discussed the NASA change management process with the Deputy Administrator. Any organization that goes through a lot of change all at one time needs to make sure that change is well coordinated and well thought out. At this meeting, the Panel learned about the existing change management process.

The process is very well aligned with existing core values and builds upon work that was started before the Columbia accident called "One NASA." The focus of the change

management process is transformational change. How does the organization make a step change in areas that it needs to while at the same time hold onto the things that are important for it to continue to do well? This effort is led out of the Administrator's Office and is focused on defining and integrating various aspects and elements of change.

There are four elements of change:

1. What are you trying to change? What are the areas of change?
2. How do you report and track change?
3. How do you lead change?
4. How do you communicate change?

There are three key areas of change:

1. Maintaining technical excellence
2. Organizational excellence
3. People excellence

The three key areas of change are not separate and distinct; they overlap each other.

How do you lead change?

1. Communicate clearly
2. Engender employee support
3. Continue to build management credibility and trust
4. Continue and build on open decision making

That is all good theory but where is NASA? When you look at clear communication, NASA has started a second round of large group meetings at all ten Centers. This follows the first round of large group meetings that happened a while ago and a series of private sessions conducted throughout the organization. This communication has been going on over the last several months. All of the organizations have an ombudsman that can listen and hear confidential comments and feed them to the right places if the individuals feel constrained. NASA established hot lines and anonymous web sites where people can post questions to facilitate more open communication. These are just examples of many ways to use multiple media methods to begin and continue to open up the culture.

KSC FACILITIES

Mr. Rick Williams discussed the Panel's review of KSC facilities.

The Panel was particularly interested in seeing the facilities for a number of reasons: to understand the hurricane damage recovery and repair, to understand the progress on return to flight (RTF) actions, and to review the infrastructure work going on at KSC.

The Panel had the opportunity to see facilities and also to talk to people who worked in every place that they visited. The ASAP reviewed the Orbiter Processing Facility, the

Vehicle Assembly Building, the Firing Room, the launch pad, the crawler transporter, and the Space Station Processing Facility (SSPF). Workers we spoke to had positive attitudes, looked forward to upcoming challenges, and recognized that there is still work to do but did not have any sense of being overwhelmed.

The ASAP saw construction contractors doing infrastructure work above and beyond what the typical prime contractors do on site. Overall, the Panel was pleased with what it heard and saw. The amount of contractor work at the moment is an issue that KSC recognizes and is taking steps to manage.

FACILITY READINESS FOR RTF

Major General Rusty Gideon discussed the Panel's review of KSC facility readiness for RTF.

The Panel reviewed the KSC Certificate of Flight Readiness (CoFR) process and the actual status of facilities to support RTF.

The ASAP felt the CoFR process is a good process and meets the Space Shuttle Program's (SSP's) needs. It is well documented, it is logical, and it is timely. There is a schedule where each facility is certified and that schedule is well integrated with the SSP Manager's schedule. The facility reviews match up with each other and all lead up to the final Flight Readiness Review that occurs two weeks before launch. The ASAP has no particular recommendations about the process.

The second review was of the status of the major facilities that support the launches. The ASAP was impressed with the rapid response to and repair of hurricane damage to several of the major facilities. Some of that repair work is still ongoing but the facilities will be ready in time to support the next launch.

The Panel believes that NASA has wisely used the time made available because of the Columbia accident. NASA has been doing a lot of preventive maintenance and improvements to the facilities to take advantage of the down time.

NASA is on track to support the next launch.

The ASAP also got the distinct impression that the facilities managers would not hesitate to say they were not ready to go if there was a facilities problem. The Panel did not feel they were schedule-driven, and safety would not be compromised.

ISS

Dr. Donahue discussed the Panel's review of the ISS systems status.

It was very exciting to see the Space Station Processing Facility. Almost all of the ISS hardware is in place and ready to go on orbit.

The ISS Program updated the Panel on the Expedition 10 crew and on-orbit systems status.

The Panel discussed three systems that have experienced problems.

These were:

1. The food shortage that occurred last fall. The panel learned that comprehensive food audits are very time consuming, so assumptions are routinely made. The crew had over-estimated how much food they had and the mixture of rations. The ISS Program understands what caused the problem and has put corrective action in place, including closer communications with the crews and agreements with the Russians about rationing and consumption.

2. Torque build-up. The ISS has been trying to understand what is causing a disturbance torque during Extra-Vehicular Activity in the Russian Orlan suits. Although they do not understand what is causing the torque, the ISS is able to maintain attitude control.

2. The Elektron functioning. The Elektron experienced a number of failures last fall, and was repaired. It then saw additional shut-downs in January and is now operating on a back-up pump.

The panel also remarked that the ISS has learned some important design philosophy lessons that will benefit future exploration plans, particularly in the areas of systems redundancy, logistics, and learning how to refurbish on-orbit.

The ISS Program has developed an emergency plan for a Contingency Shuttle Crew Support (CSCS) (safe haven) aboard the ISS. The safe-haven capability is a NASA decision and not a CAIB recommendation. ISS has identified a best-case and a worst-case capability to support the Space Shuttle crew on-orbit for an extended stay in case of an emergency. The ISS also identifies the most likely circumstances using their best engineering judgment to estimate a likely available CSCS
duration. Currently that duration is 45 days. NASA can launch a rescue mission for STS-114 in 33 days.

Vice Admiral Dyer said that in commercial and military aviation, there are two debates on logistics: should you do time-based (preventive) maintenance or wait until it breaks? These two options are playing out in real-time on the ISS.

KSC SMA

Mr. Steve Wallace discussed the Panel's review of KSC SMA.

KSC has made major changes in their SMA organization.

KSC briefed the Panel on their overall SMA organization, safety metrics, and Close-Call Program. KSC discussed how they differentiated between a hazard and a close-call. The Panel is happy to see that KSC is working on combining both categories and reporting them all as close-calls.

KSC also briefed the Panel on the SMA CoFR process and range safety. The range safety discussion also included landing range safety which was one of the CAIB observations to protect the public on entry.

Ms. Grubbe added that the Panel was encouraged that NASA was benchmarking industry on how they manage subcontractor safety. She said that there is a relationship between slips, trips, and falls and system safety.

Mr. Williams added that KSC identified issues with subcontractor safety by reviewing their safety metrics. KSC is just now moving toward combining their hazards and close calls. This is good that NASA is moving toward a standardized approach. NASA should strive to be consistent and drive out the situations where there is no cause to be different.

Mr. Marshall said that on a wide range of topics, the Centers have developed their own programs. The Panel continues to see opportunities for standardization. This is an area that the ASAP would like to look into further.

SSP PLANNING FOR LAST FLIGHT

Dr. Dan Crippen discussed the Panel's review of the SSP's planning for the last Space Shuttle flight.

NASA Headquarters will have to make some of the decisions on planning for the last Space Shuttle flight.

NASA has not shut down a major Program since Apollo. There will be a number of things that NASA will need for follow-on Programs. Some capability still needs to be preserved. The Panel has several concerns about NASA's ability to keep people in the SSP and maintain the core competencies that are necessary to keep the Program running safely until the last flight.

The demographic bulge is coming. Government employees can retire early and many are already eligible. We also have a Russian partner that has the same issue. This subject will continue to be of interest to NASA. How do we maintain core competencies and how do we restructure current contracts to maintain the proper skill base all the way to the last Shuttle flight?

The SSP is in the exploratory phase right now and the next phase will be done in mid-2005. NASA needs a plan to maintain competency. NASA may want to think about

assigning someone organizationally outside the SSP to manage the decisions required to shut down the Program.

CREW EXPLORATION VEHICLE (CEV)

Vice Admiral Joe Dyer discussed the Panel's review of the CEV Program.

Vice Admiral Dyer was happy to report that Safety is up front and a pillar of the CEV Program. The next vehicle will take humans to the Moon, Mars, and beyond. The first human flight will be in 2014. The next spiral will be to the Moon and then beyond in the third spiral. The draft Request for Proposal is out for review and the Exploration Program is planning to award a contract in the fourth quarter of fiscal year 2005.

PROBABILISTIC RISK ASSESSMENT (PRA)

Ms. Grubbe discussed the Panel's review of PRA.

There are several types of risk: schedule risk, safety risk, technical risk, and financial risk. The ASAP only focused on safety and technical risk.

There are many different ways to measure risk. There are different tools to measure and analyze risk like fault tree analysis, failure modes and effects analysis, PRA, hazard and operability studies, what if, checklists, etc. These tools are all different. Sometimes it is better to use one kind of tool in a certain situation over another kind of tool. You can always argue over which tool is the best tool for any particular situation. When you look at risk, you are dealing with uncertainty. There is randomness around the model. The same equations do not always fit for every situation. The models themselves have a level of uncertainty.

The ASAP reviewed the tools that NASA has used over the years to manage, measure, and analyze risk. The capability of these models have continued to evolve as technology has improved. The CAIB discussed PRA but did not make any formal recommendation. PRA is a step above fault tree analysis in complexity.

There are three events that can lead to an incident: initiating event, pivotal event, and the actual end-state. There are several kinds of analysis that you need to do when performing a PRA: detailed technology information on the systems, logic diagrams, event sequencing, and failure history data. These are the kind of things you need to build a PRA. PRA can help your decision making but the models have to be right. There are significant cautions: the numbers are not always good because of levels of uncertainty, and the tool is not precise. PRA is better used when the situation is discrete and limited in scope. It is meaningless to string together different kinds of models with different levels of precision. It is more useful to compare similar models. If you are going to use PRA, you need to use it in the way that it was designed. PRA can be used to compare relative risk on similar systems.

The ASAP did a lot of learning. NASA is using PRA and needs to make sure they are using PRA for what its intended purpose.

Dr. Crippen commented that the Stafford-Covey RTF Task Group has a concern with the use of analytical models and the appropriate use of models. Models are clearly helpful in almost every endeavor. Models are only as good as their assumptions. Across different models you have different quality of assumptions. Some models have data to back them up, some have theory, and some do not have much of anything. You have to be careful. The Columbia accident was two wrong-held faulty assumptions: the ballistic momentum of foam and how the aerodynamics of the Shuttle worked. Those two faulty assumptions were in essence proven over 100 flights but they were still wrong. The trick in an analytical organization is to get people to test their assumptions, especially after they have held them for a long time and they seem to have been proven right. It is the inappropriate use of models that can get you in trouble. The PRA model was clearly developed to make assessments between two alternatives. PRA can be misused to add up disparate numbers to try to make something of the totals. It could be useful in some limited situations but only if you understand the limitations very clearly. One of the numbers that came out after the Columbia accident was that there was something like a 1/250 chance of mission failure. That is a totally inappropriate use of PRA and the number itself. The ASAP's concern is that NASA does not continue to misuse or represent numbers that are not quite correct or are misleading.

Dr. Donahue added that neither the RTF Task Group or ASAP is saying to not use models. Decision makers should have qualitative and quantitative data to make decisions. A suite of tools is appropriate and PRA is one of those tools. The concern is to use the numbers appropriately and not publish numbers that are not meaningful. NASA has done exceptional work on PRA over the last five years, and it really is an impressive model.

CONCLUSION

Vice Admiral Dyer thanked the leadership of the Florida Space Authority for allowing the ASAP to hold the Public Meeting in their facility.

MEETING ADJOURNED

Vice Admiral Dyer adjourned the meeting and opened the floor to questions from the public participating in the meeting.