

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

February 11, 2013

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

Dear Mr. Bolden:

The Aerospace Safety Advisory Panel (ASAP) held its 2013 First Quarterly Meeting at Kennedy Space Center on January 24-25, 2013. We greatly appreciate the participation and support that was received from the subject matter experts and support staff.

The Panel submits the enclosed Minutes and Recommendation resulting from this meeting for your consideration. As part of its response to our recommendation, we request that NASA provide an Agency Point of Contact (POC) and the expected completion or implementation date for the action.

Sincerely,

A handwritten signature in black ink, appearing to read "J W Dyer". The signature is fluid and cursive, with the first letters of the first and last names being capitalized and prominent.

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

Enclosure

**AEROSPACE SAFETY ADVISORY PANEL
Public Meeting
January 25, 2013
Kennedy Space Center (KSC)
Cape Canaveral, FL**

**2013 First Quarterly Meeting
Report**

Aerospace Safety Advisory Panel (ASAP) Attendees

VADM (Ret.) Joseph Dyer (Chair)
Dr. James Bagian
The Hon. Mr. Claude Bolton
Capt. Robert Conway
Mr. John Frost
Dr. Donald McErlan
Mr. Bryan O'Connor
Dr. Patricia Sanders

ASAP Staff and Support Personnel Attendees

Ms. Harmony Myers, ASAP Executive Director
Ms. Susan Burch, ASAP Administrative Officer
Ms. Paula Burnett Frankel, Technical Writer/Editor

NASA Attendees

Pat Simpkins, NASA/KSC/Engineering
Russell Romanella, NASA/KSC/SMA
Russ DeLoach, NASA/KSC/SMA
Scott Chandler, NASA HQ/HEOMD
Tracy Young, NASA/KSC/PA
Bill Stover, NASA/KSC/CCP SMA
Derrick Bailey, NASA/KSC/SMA
Maynette Smith, NASA/KSC/SMA
Rob Ellison, NASA/KSC/SMA
Dee Dee Healey, NASA HQ/OSMA

Other Attendees

James Dean, *Florida Today*
Yash Mehta, Embry-Riddle Aeronautical University

OPENING REMARKS

VADM Joseph Dyer called the ASAP's First Quarterly Public Meeting of 2013 to order at 10:00am. After Panel member and attendee introductions (see above list), VADM Dyer thanked Mr. Robert Cabana, KSC Director, for his hospitality in hosting the meeting. On behalf of the ASAP, he expressed appreciation to the team at KSC as well as NASA Headquarters for their support.

On Wednesday, the ASAP met with United Launch Alliance (ULA), which is the organization that is providing launch services for two of the commercial crew partners (Boeing and Sierra Nevada Corporation). The information presented was proprietary and could not be shared at this public meeting. Both companies were very professional and the ASAP was favorably impressed. The Panel has now visited all parties that are going forward with commercial crew transportation development. As noted by one of the Panel members, Dr. Patricia Sanders, there is a continuum for any advisory group between being advisers and being critics; ASAP wants to be on the advisor end of that continuum functionally and would prefer to address developing positions and decisions rather than those already finalized.

VADM Dyer invited attention to the ASAP's 2012 Annual Report to the NASA Administrator and Congress that was published earlier in January. The Report highlights six issues, the most pointed of which are funding uncertainty and the Commercial Crew Program (CCP). VADM Dyer cited passages from the cover letter to the Report:

"...the Funding Uncertainty and Commercial Crew Program are interrelated and of the most concern. For the last two years, the CCP appropriation has been approximately one half of the budget request. Informal communications with congressional staffs indicate this will probably be the case again in FY 13."

The appropriation drives a disconnect between planning and the funds to execute that plan. Why is this? The ASAP hears both sides of the story:

"The NASA program team highlights inability to execute the program of record and grapples with the necessity to modify acquisition strategy to adjust for the funding shortfalls. The Congress notes the lack of credible cost estimate [from NASA], the absence of an integrated schedule, and 'program instability.' In the Panel's opinion, a consensus between the Congress and NASA will be required to resolve this conundrum. In FY 13 we predict this planning-funding disconnect will again drive a change to acquisition strategy, schedule, and/or safety risk."

Reflecting on NASA requirements, it is a concern to ASAP that some are supportive of a higher risk, purely commercial approach that may or may not be appropriate, but it raises questions as to who acts as the certification authority and what differentiates public and private accountability. The ASAP is concerned that separating the level of safety demanded in the system from the unique and hard-earned knowledge that NASA possesses has potential to introduce new risks and unique challenges to the normal precepts of public safety and mission assurance. It is not ASAP's role to determine how to answer the uncertainties, but under the umbrella of advice rather than criticism, the Panel believes that it would be good to pursue some clarity.

VADM Dyer noted that ASAP members would report on the topics from the fact-finding meetings the previous day. At prior meetings, the ASAP has heard from the program managers on the major topics; this time, the ASAP heard from the programs' Chief Engineers and the Chief Safety Officers (in addition to the program managers) in the areas of Commercial Space, Explorations Systems Development (ESD), and International Space Station (ISS).

CCP CHIEF ENGINEER AND CHIEF SAFETY OFFICER UPDATES [reported by Panel member Dr. James Bagian]

Mr. Steven Sullivan, CCP Chief Engineer (CE), leads the CCP's Engineering Technical Authority (ETA) and sits on the program board as a voting member. Mr. Sullivan described the way they assign a principal engineer to each partner, and the Panel obtained clarity about how that worked. It appears to be a good way to understand what is going on. With regard to cross-cutting functions, they have discipline lead engineers across all the partners and beneath them, they have discipline support teams. This appears to be a thoughtful way to gather information. The total Full Time Equivalent (FTE) is not large, and this creates challenges. They recognize that, and are trying to get what they can. One of the challenges in the Certification Products Contract (CPC) phase is how they are going to handle the "meet the intent of" for the NASA requirements. They are drafting a white paper to address that concern. The ASAP believes that there is a need for clarity about standards and requirements, and the sooner the better for both the partners and NASA. Under the Space Act Agreement (SAA), some of the partners have been very transparent, but because it is a new process, the effort requires iteration. Mr. Sullivan acknowledged that there has been variability in the level of information provided by the different partners under the SAAs. The CPC should change that, and NASA should get the level of information that it needs.

The Panel also heard from the CCP Chief Safety Officer (CSO), Mr. Scott Johnson, and he talked in general about how SMA fits into the program. He noted that Micro-Meteoroid and Orbital Debris (MMOD) is probably the single biggest risk in flight, just as it is for ISS. They are continuing to examine that issue as well as how to look at the various approaches, understand them, and have confidence in the alternative methods.

ASAP member Mr. Bryan O'Connor observed that there were a couple of interesting briefings, including one on how they dealt with a problematic technical requirement—manual flight control. Human rating requirements specify that manual control be available wherever it is appropriate. They had to examine this requirement carefully to see if it made sense to keep manual control as a capability for the commercial vehicles. As a result, this particular requirement may be modified significantly for this program. Orion is looking at the same requirement. In terms of resources, NASA has trimmed the TA and SMA workforce, and they are at very low levels. In the SAA environment, the Safety and Mission Assurance (SMA) is in an advisory role and is not doing traditional audit or certification-focused independent assessment. As they look forward to CPC, Mr. Johnson indicated that he does not yet know how he will address anticipated workload surges, but he is examining ways to obtain more resources. The ASAP will follow this issue and discuss it further at future meetings.

CCP PROGRAM MANAGER UPDATE [reported by Panel Chair VADM Dyer]

The ASAP had an opportunity to dialog with Mr. Phil McAlister, Director of Commercial Space Flight Development, and Mr. Ed Mango, CCP Program Manager. As always, the discussion was energetic. The ASAP believes that the CCP going "on contract" for the two phases of the certification process is a very important and essential step forward. Over the past several years, ASAP has posed the question again and again: How will NASA certify? How will NASA know if the commercial vehicle is "good to go?" The ASAP would have liked to have seen it undertaken earlier, but the crew certification phases one and two are steps in the right direction. The Panel is still striving for clarity and understanding with regard to the SAA as it is in place for commercial crew

transportation system development and the transition to a FAR-based certification contract; for example, the on ramps, off ramps, what is accomplished in each area, etc.

VADM Dyer read a statement prepared by NASA regarding certification:

“NASA is running the CPC contracts in parallel with the Commercial Crew Integration Capability (CCiCap) space act agreements today. This is allowed because they are separate activities with distinct goals. However, the goals of the program do not change nor do they end at the conclusion of the [SAA] base period.

There has been no formal Agency-level decision at an Acquisition Strategy Meeting regarding the specific scope and mechanism of the Phase 2 Certification effort. However, we have determined that all NASA certification activity needs to be performed under a Federal Acquisition Regulation (FAR)-based contract. In addition, NASA has been clear that it does not intend to exercise the optional milestones [carrying out flight test by the provider under the SAA].

However, NASA may choose to pursue some of the initial optional milestones or a portion of a milestone if exercising them furthers the purpose of developing a capability that could ultimately be available to serve both government and commercial customers, but the benefit to the government would need to be high. NASA will not fly people to orbit under a space act agreement.”

VADM Dyer noted that this statement attempts to capture a lot of the discussion and provides some clarity with regard to yesterday’s dialog on commercial space.

Panel member Dr. Donald McErlean added that there is still a need for an agreement between NASA and the Federal Aviation Administration (FAA) on how they will conduct the trade-offs between crew safety and public safety. For example, should the rocket veer off course, there must be a delay built into issuing the destruct signal to allow crew escape before range safety termination. This task is still in front of them.

Panel member Mr. John Frost noted that NASA and the nation are blazing new trails and attempting new ways of getting to space. It is a trail that is not well marked. One of the areas that has created many questions is: What does it take to approve a human to go to orbit? NASA has its long-proven method for its astronauts. How can it bridge that gap between that program at one end and less rigorous programs, e.g., commercial crew, on the other? This debate has been difficult because we do not have a philosophical underpinning of the certification process—when do we do it and who does it? Mr. Frost proposed a recommendation that NASA develop a philosophical approach to the certification process; specifically, when NASA certification is required and when it is not. There are some subtle nuances about NASA missions—when are they NASA missions, what kind of crew, etc. There has been good dialog; now is the time to capture that into a single philosophical approach to certification. Along those lines, they are working on a white paper on specifically how they will do certification. This paper is still in draft form, and in line with the comment about being advisors rather than critics, the ASAP would like to see that paper in draft form to see if it could offer some thoughts that might improve it. Early on, when consideration was being given to using expendable launch vehicles (ELVs), there were questions about different levels of safety. One of the big “sticking points” has been the “factor of safety.” In other words, how much stronger than the expected loads does the system need to be? The less that is known about the strength of the material, the more separation is needed between the loads and the strength of the material. The classical manned system has been designed to a 1.4 factor of safety. Many ELVs are designed to less, e.g., 1.25. That doesn’t necessarily mean they are unsafe. Many of these ELVs have a long history that provides a lot of information about loads and material strengths. They may be as safe, they could be safer. NASA is performing evaluations and is developing a white paper on how they will make those decisions. The ASAP requested a copy of that developing white paper as well.

The ASAP concurred with the formal recommendation regarding certification and the two data requests.

ESD PROGRAM MANAGER UPDATE [reported by Panel member Dr. Donald McErlean]

Mr. Daniel Dumbacher, Deputy Associate Administrator for Exploration Systems, started his briefing with an interesting point: the hardware for ESD, especially with regard to the Orion Multi-Purpose Crew Vehicle (MPCV), goes back to 2008, e.g., the abort motor testing, the air-bag drop testing, etc. Most importantly, within the past year, NASA has had very successful MPCV environmental and parachute testing. Just last year, Engineering Flight Test (EFT)-1 (the current nearest-term focus of the program) was delivered and is on track for launch in 2014. It will be the first opportunity for the MPCV to fly into space. It will fly a highly elliptical orbit to build up the reentry velocity so that the heat shield will experience some percentage (about one-half to

three-fourths of the heat load) of the trans-lunar insertion heat load. The ASAP has viewed the EFT-1 MPCV at KSC, and Dr. McErlean noted that the parachute drop test was completed in 2012. The RS25 processing facility for KSC has been delivered and is in place. The multi-stage adaptor forging, which represents some of the largest forgings ever accomplished by American industry, has been completed and the hardware is on its way to KSC. Modifications to the Vehicle Assembly Building (VAB) are in process and fixed decks are being replaced with moveable decks to deal with different types of boosters. This puts KSC in position to launch the next generation of launch systems. The recovery training with Navy crews and ships has been underway because the EFT-1 and Engineering Module (EM)-1 and EM-2 will be water recoveries. An agreement with the Navy has been signed for support of those launches. The ground system development is ongoing—the processing facility, the VAB, the mobile launchers, etc. With regard to schedule, EFT-1 is on track. The highest risk item for EFT-1 is the booster, which has an interim cryogenic propulsion stage (ICPS) that will be different from EM-1. One of the primary purposes of EFT-1 is to test the heat shield. Reentry velocities from trans-lunar orbit are far higher than from low Earth orbit (LEO). The highest risk item for the program is the near-term budget for EM-1. It is not the total cost that is the problem, but the phasing of the expected funding. In terms of engineering, the two principal technical concerns are mass control (approximately 4000 to 5000 lbs. in the total system that they want to remove) and the pad emergency egress system. The heat shield is the key technology driver. There has been a great deal of progress on this program that the ASAP feels is vital to the nation's space interests.

VADM Dyer agreed that the program is challenged in working to the budget constraint. Because ESD is “level funded,” this drives some constraints and inefficiencies and challenges the program team. Overall, they are doing very well and it is an impressive undertaking.

ESD CHIEF ENGINEER UPDATE [reported by Panel member The Hon. Claude Bolton]

The ASAP learned about the ESD CE role in the ESD program from Mr. Paul McConnaughey, the ESD CE and the Cross-Program Systems Integration (CSI) Director. He cited three examples of current technical issues: the Orion proof test crack; the ICPS hydrogen tank stretch decision; and the Space Launch System (SLS) booster Flight Termination System (FTS) range waiver. His final discussion item for the ASAP was highlighting the principle risks to accomplishing organizational objectives for successful EM-1 and EM-2 flights.

According to Mr. McConnaughey, the role of the ESD CE is to integrate the element designs that are being developed by the three programs of SLS, Orion, and Ground Systems Development and Operations (GSDO). Technical Authorities (TAs) do exist, have been named, and are working as an integrated team. The TAs do not report to the ESD CE. A cross program system integration office called CSI has been established to perform the system engineering and integration (SE&I) activity for the SLS, Orion, and GSDO programs. The CSI works the integration activities on a 24/7 basis. Weekly, a formal teleconference phone call takes place that brings the three program CEs, the ESD CE, and the Agency CE together to work the technical topics for all three programs. According to all the CEs who briefed the ASAP, this approach—working day-to-day activities through the CSI and the weekly telecons—has provided an effective way of integrating the “system of systems” consisting of SLS, Orion, and GSDO.

Ms. Julie Kramer-White, the Orion MPCV Program CE, discussed one of the current technical issues—the Orion proof pressure test crack. She gave a good recount of the history, root cause analysis, and remedy. During proof pressure testing of the EFT-1 crew module pressure vessel, the aft bulkhead experienced a localized structural overload. The failure was detected by both an audible noise and a change in the strain data instrumentation. The failure consisted of three integrally machined ribs at the 270 degree location on the aft bulkhead. The failure had several contributors: using aluminum (AL) 2195 to make unique geometric features, i.e., truncated ribs; analytical methods that had insufficient fidelity to predict yield stress concentrations in the rib run outs; insufficient material strength and ductility for the design; and the combination of residual stresses not adequately quantified and accounted for in the analysis for welds and contours. Several factors degraded the failure prediction. These included: pre-test modeling under-predicted stress levels; material allowances that were lower than published allowances; the bulkhead was in the yield region and the material had significantly less elongation than published allowances (4% versus 1%); and the pre-test analysis did not account for residual stress caused by welds and contours.

The repair plan for the bulkhead was to do the following: remove the damaged structure and install repair; complete the corrective actions that are constrained to static loads test; test the repair off-vehicle to characterize the repair; and test the repair on-vehicle as part of an upcoming structural loads test. The long term corrective actions are to redesign the aft bulkhead for EM-1 and subsequent builds in work and to update the analysis process and the build process based upon lessons learned from this failure episode.

The briefing provided by Ms. Kramer-White was very good and allowed the ASAP to clearly understand the failure and the level of NASA expertise and professional approach. In the ASAP's opinion, this demonstrated the high degree of talent, expertise, and

professionalism the NASA team continues to bring to very demanding technical subjects. With the Orion structural test failure in mind, the ASAP suggested that NASA should look at methods and models capable of assessing multiple independent failures or failure causes occurring at the same time.

The two remaining examples of current technical issues that were done in less detail were the ICPS hydrogen tank stretch decision and the status on the SLS booster FTS range waiver. Regarding the ICPS hydrogen tank stretch decision, the End-to-end Mission Performance Team (EMPT) completed mission level analysis and determined that there was marginal capability to complete the EM-1 Free Return through Dec 2017 and the EM-2 high lunar orbit missions with limited windows through August 2021. An Integrated Product Team (IPT) developed possible mitigations to improve performance margins. The IPT determined that an opportunity to improve ICPS performance for relatively little cost/schedule impact would provide maximum improvement. Analysis showed that a stretch will allowed increased capability, significant positive payload and mass margin, and low additional program cost.

The last example was the “booster FTS wavier status.” The issue was the requirement for the FTS linear shaped charge to be capability of shearing 150% of the maximum material condition. The current design can do only 127%. The 45th Space Wing (SW) commander will not provide range clearance unless NASA meets this requirement. NASA’s plan is to use pressure assist from the internal motor pressure to meet the required capability. The 45th SW has concurred with NASA’s approach and test plan. Test is ongoing and final test results will be provided to the 45th SW. If the final test results are accepted, the range requirement will be tailored with the 45th SW approval. The SLS CE expects closure and agreement with the 45th SW commander.

On the technical side, both Mr. McConnaughey and Ms. Kramer-White exemplified world class work.

Mr. Frost added that the pressure vessel story was an outstanding analysis of an anomaly. They understood what was needed and the importance of lessons learned. What ASAP has seen in the past is that NASA stopped at analysis and corrective action. In this instance, the CE took the action to incorporate the lessons learned make them part of the NASA process. VADM Dyer agreed that the key is not only how to capture the lessons learned, but make them available to others in the future rather than just vested in the people involved. This “knowledge afterlife” becomes even more critical for the commercial partners.

ESD CHIEF SAFETY OFFICER UPDATE [reported by Panel member Capt. Robert Conway]

Mr. David Thelen, ESD CSO, discussed how his organization integrates safety, reliability, and quality aspects of the ESD elements. There are three main systems: MPCV, SLS, and GSDO, and the CSO functions are integrated along those lines. They apply a “lean” staff of five: three FTE civil servants and two contractors. To get oversight on all ongoing programs, there are integrated task teams within each of those projects. There is a wide range of responsibilities that require a large range of resources, and the SMA TA is being integrated as well. With a small workforce and the leveraged manpower integration, a robust TA is very important, both in structure and practice. The arrangement appears to be working. There have been some other Technical Authority issues that were discussed regarding “big” TA (Technical Authority oversight, approvals, verifications, etc) versus “little” ta (technical advisors). The ASAP will keep an eye on this area as ESD progresses. One of the technical safety issues was highlighted—the ICPS and the requirement for manual steering (noted by Dr. McErlean earlier) for the EM configuration. The ASAP was impressed by the thought process that went through the probabilistic risk assessment (PRA). For the ICPS, it was concluded that manual steering was not needed.

The last part of Mr. Thelen’s discussion was “what keeps him up at night.” Although the organizational structure is working, it could have a more robust foundation with clearer procedures. All the mitigators that are currently in place have their own challenges and risks, and reducing these would be most effective. The ASAP reviewed a risk acceptance matrix that depicted who the risk acceptance authority would be in the 5 x 5 matrix. The ASAP asked several questions regarding risk definitions and the rationale for the decision levels for various risk levels including those of catastrophic severity. Mr. Dumbacher offered to take another look at the decision levels, further define them, and brief the Panel again at a later meeting.

Mr. Frost noted that with regard to the risk chart, one of the key elements is risk management. This chart had a couple of issues new to the Panel. One of those was assigning to the developing contractor the risk acceptance for potentially severe injury to government employees. “Severe” injury means any injury requiring medical treatment, but not severe enough to end the mission. This may be stepping on what may be inherently governmental in nature. Within the DoD, this has always been a government decision. The ASAP felt that the program should take a look at the legality aspects as well as the intelligence for continuing this approach.

VADM Dyer added that the NASA people stated that they would never allow contractors to have the risk acceptance for injury to government employees; however, the risk chart does say that. NASA as an employer has an obligation to make the decision about the safety of its employees, and it should not be delegated.

Mr. O'Connor noted that the integrating program is located at NASA Headquarters (HQ) in Washington, DC, which is not an engineering center. The SE&I function is done by civil service employees spread throughout the agency, but managed at NASA HQ. This is a big challenge and always has been. In the Apollo days, the integrated level was at NASA HQ, but the program also had an "integration contractor" that provided the systems engineering support. One of the things they have done in the accountability risk matrix is delegate responsibility for risk acceptance of catastrophic hazards (what has traditionally been in the "yellow" risk zone) to the projects. Things that used to be called "projects" in Space Shuttle are called "programs" here. For example, the MPCV program is authorized to accept catastrophic risk (loss of vehicle, loss of crew) if it is not an "integrated" hazard, i.e., the hazard is unique to MPCV and none of the causes or controls is in the SLS or GSDO. This has not been done in Shuttle, ISS, and Constellation. The ASAP questioned this approach and whether it is appropriate. In the ASAP's view, anything that is catastrophic to crew should, by definition, be an integrated hazard and therefore not be delegated to what has traditionally been the element or project level for final approval. Mr. Dumbacher agreed that ESD would take another look at this.

ISS PROGRAM MANAGER UPDATE [reported by Panel member Dr. Patricia Sanders]

The ASAP received the usual excellent presentation by Mr. Michael Suffredini, ISS Program Manager. Mr. Suffredini hit all the key topics of interest to the ASAP. He provided an update on the flight schedule and work plan for the ISS, including a discussion on the status of both the Orbital and SpaceX planned events. He thoroughly addressed the challenges his program faces and discussed a number of ongoing issues in detail and the steps to their resolution. In addition, he covered a number of topics of particular interest to the ASAP, including radiation monitoring, visual impairment/intracranial pressure, the implications to the ISS of the current Boeing 787 battery issues, the Bigelow Expandable Activity Module (BEAM) project, and the Briz-M breakup. In particular, he addressed ASAP's interest in station End-Of-Life (EOL) planning and life extension as well as MMOD impact mitigation. The ASAP was pleased to see progress towards these items and will continue to monitor them. The Panel appreciated inclusion of the program risk matrix in the presentation.

The ASAP passed "kudos" to Mr. Suffredini with respect to the "Spot the Station" website that appears to be creating a positive buzz for NASA space programs.

ISS CHIEF ENGINEER UPDATE [reported by Dr. McErlan]

The ISS engineering team is very well-experienced. Mr. Christopher Hansen, the ISS CE has 12 years on the Station Program and almost six as CE. Clearly, a long-standing team, coupled with high capability and credibility, makes things go easier. Mr. Hansen has dedicated systems engineering teams in a number of areas, broken down by key systems in the ISS, such as thermal control, crew health care, EEE parts, etc. They are working continuously on issues associated with the ISS program. NASA and the Boeing systems integration contractor are well integrated and operate effectively as a single team and this is a true advantage. The systems team is paid for by ISS but reside within the JSC engineering organization and are accountable to the Engineering Technical Authority that provides the "alternate path" to raise an issue, should an engineer find some decision with which he is uncomfortable. In the process of this briefing, Mr. Suffredini noted that he is a proponent of that and is open to issues, and would not move forward with a decision if his TA, either the CSO or the CE, disagrees with it. This approach works today because of superb and highly experienced individuals on the program. The ISS has a great team and they are working together to solve the problems. However, there are still some concerns whether the TA process is lying "flat" as well as the ASAP thinks it should. Mr. Hansen described the TA model. He has a small staff and relies heavily on the systems teams for their technical insight.

The ISS program works closely to ensure that the ISS program effectively performs risk trades. They have a risk control board and a programmatic risk acceptance board. The risk acceptance board doesn't accept risk, but recommends risk decisions that go forward to the program level with the Program Manager and the TAs. That is where the risk is either accepted or not accepted. If there is disagreement, it is passed to a higher level or resolved at that level. The Program Risk Acceptance Board (PRAB) is chaired by the Program Manager himself with membership of every major ISS office lead, so it is a broader group than the control board. Mr. Suffredini pointed out that he likes to get all the opinions from people who have input and take them into consideration. Mr. Hansen discussed his risk matrix chart. He is also concerned with budget levels because they can impact his ability to draw upon subject matter experts from other parts of the Agency. In terms of challenges, Mr. Hansen feels that the technical issues that are within his control (system replacements, repairs, etc.) are being effectively addressed. There are things out of his control—the MMOD environment (which has been dramatically improved, especially with the additional shielding on the Russian Soyuz module) and other quality assurance issues that are not within his direct purview.

ISS CHIEF SAFETY OFFICER UPDATE [reported by Panel member Mr. Bryan O'Connor]

Mr. George Gafka, ISS CSO, briefed the Panel on his function and presented some interesting background material. It goes to the basis of how they do SMA. The real challenges for SMA on ISS is the complexity of the program—the international partners, all the ways that they deal with visiting vehicles, and the insight/oversight models, which are immense in number. They try to keep a several things constant, e.g., certifying for docking; however, the problems and quality issues are all different and it is a real challenge to the SMA community. They have a significantly larger workforce than other programs. For example, because of so many interfaces, several people do the function of the single CSO on commercial crew. Mr. Gafka is the TA, a very important function for the CSO, but he does not also manage the SMA workforce—that is another person. They all work very closely together and are matrixed to the program. Many may think of the ISS as a benign, inert vehicle in orbit, they don't realize the number of little things that happen every day that challenge the crew and engineering support on the ground. Mr. Gafka talked about the guiding principles on how to be a CSO on big programs like this. The first one he drew from *The Federalist Papers*—Number 10 from James Madison: “No man is allowed to be a judge in his own cause.” In other words, you can't check you own work. With all the “dual hats” and “triple hats,” which are used on some other programs to be affordable and “lean,” that principle still applies. We need to be very careful about it. He also quoted former Program Manager Tommy Holloway: “We're not as smart as we think we are.” When the Program Manager says that, it should be an alert to everyone who tries to keep him out of trouble. The ISS program has a culture that encourages everyone to come forward, including the contractors. These are important aspects. Other things that were mentioned were redundant to what the Panel heard from the CE. The safety people were intimately involved in the MMOD/Russian module shielding issue. Another long-time issue was reduction of toxicity-4 batteries, and they did a lot of good work there. Mr. O'Connor cited several other positive examples of efforts that have been done over the past year with major participation of the SMA team.

UPDATE ON ASAP RECOMMENDATION 2012-03-05 – FIVE-YEAR ROADMAP FOR CONTINUOUS IMPROVEMENT FOR THE AGENCY'S MISHAP INVESTIGATION PROCESS [reported by Panel member Mr. John Frost]

The ASAP has had a number of issues with mishap investigations, principally the timeliness for completion and how the data was used. The update to NPR 8621.1B fixes a lot of issues that the ASAP had identified, brings it up to date with categories of accidents, establishes dedicated mishap investigation teams, and has many other positive features. The NPR update should be released in June 2013, and the ASAP would like to keep the recommendation open until then. One of the issues addressed is investigation of flight incidents. As we move to the commercial world, this becomes an issue—which ones we do and how. There was a back-and-forth discussion on the definition of certification and what missions it relates to. The ASAP encouraged NASA to look specifically at the definition of certification and which missions the Agency would do investigations on. The two should be linked.

MEETING WRAP UP

VADM Dyer acknowledged the Panel's support team: Ms. Paula Frankel, the ASAP scribe/editor; Ms. Susan Burke, the Administrative Officer from NASA HQ; and Ms. Harmony Myers, the ASAP Executive Director. He noted that Ms. Myers, who has been supporting the ASAP for about a year on temporary duty from KSC, would be transitioning to NASA HQ to continue to work with the ASAP on a permanent basis.

There were no public comments or questions, and VADM Dyer adjourned the meeting at 11:27 a.m.

ASAP RECOMMENDATION, FIRST QUARTER 2013

2013-01-01 Philosophy on the Certification Process [ASAP point of contact John Frost]

Finding: NASA and the nation are blazing new trails and attempting new ways of getting to space. It is a trail that is not well marked. One of the areas that has created many questions is: What does it take to approve a human to go to orbit? NASA has its long-proven method for its astronauts. How can it bridge that gap between that program at one end and less rigorous programs, e.g., commercial crew, on the other? This debate has been difficult because NASA does not have a formal policy with rationale that clearly states what types of designs and/or operations must be certified by NASA.

Recommendation: NASA should develop a philosophical approach to the certification process; specifically, when NASA certification is required and when it is not.

Rationale: There are some subtle nuances about NASA missions—when are they NASA missions, what kind of crew, etc. There has been good dialog; now is the time to capture that into a single philosophical approach to certification. The CCP is working on a white paper on how it will do certification; however, an overarching statement on NASA's philosophical approach to certification would provide needed clarity to all parties.