

NASA AEROSPACE SAFETY ADVISORY PANEL
National Aeronautics and Space Administration
Washington, DC 20546
Dr. Patricia Sanders, Chair

October 20, 2016

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 2016 Fourth Quarterly Meeting at Johnson Space Center, Houston, Texas, on October 4-6, 2016. 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 the public meeting for your consideration.

Sincerely,

A handwritten signature in cursive script that reads "Patricia Sanders".

Patricia Sanders
Chair

Enclosure

**ASAP AEROSPACE SAFETY ADVISORY PANEL
Public Meeting
October 6, 2016
Johnson Space Center
Houston, TX**

2016 Fourth Quarterly Meeting Report

**Aerospace Safety Advisory Panel (ASAP)
Attendees**

Dr. Patricia Sanders, Chair
CAPT Christopher Saindon
Mr. John Frost
Dr. Donald McErlean
CAPT (Ret.) Brent Jett
Dr. George Nield

Telecon Attendees:

Annette Hasbrook, GA
Karen VanSant, NASA MSFC
Kristen Vanwychen, GAO
Lynne Loewy, NASA HQ
Richard Gran, NASA JSC
Mike Bimes, Huntsville

**ASAP Staff and Support Personnel
Attendees**

Ms. Carol Hamilton, NASA ASAP Executive Director
Ms. Marian Norris, NASA ASAP Administrative Officer
Ms. Paula Burnett Frankel, Writer/Editor

Other Attendees:

Bill Jordan, NASA CCP
James Rush, NASA Safety
Nigel Packham, NASA JSC
Wayne Hale, NAC HEO Committee

Opening Remarks

Ms. Carol Hamilton, NASA ASAP Executive Director, called the meeting to order at 10:00 am. Dr. Patricia Sanders, ASAP Chair, thanked Dr. Ellen Ochoa and the Johnson Space Center (JSC) for hosting the ASAP's Fourth Quarterly Meeting of 2016, and noted that the environment was certainly one conducive to productive discussions. She announced that NASA completed Fiscal Year (FY) 16 with zero Agency level (Type A, B or High Visibility) mishaps, so well done NASA. The Panel was aware that Kennedy Space Center (KSC) was shut down the day before as Hurricane Matthew approached, and everyone's thoughts were with them. Dr. Sanders also acknowledged the participation of Mr. Wayne Hale, the Interim Chair of the NASA Advisory Council (NAC) Human Exploration and Operations (HEO) Committee, at this meeting. Strengthening the relationship between the NAC and the ASAP has been a positive step.

Dr. Sanders especially thanked Dr. Ochoa for walking the Panel through several insightful examples of the principle of the Technical Authority (TA) at work. She noted that it is gratifying to this Panel, which has been a strong proponent of the TA role, to see its positive impact, particularly on design and test for safety.

The ASAP also appreciated the insights provided by discussions with personnel from the Flight Operations Directorate. Clearly, they are having a positive impact (as they should) on multiple aspects of human space flight developments—seat angle, manual control mechanisms, suit design, pad egress.

Mr. Bill Gerstenmaier, Associate Administrator of the Human Exploration and Operations Mission Directorate (HEOMD), took time to review with the Panel the ongoing evolution of the "Journey to Mars." NASA is in the midst of what is probably its most comprehensive set of development efforts ever undertaken and has been

maturing the objectives for each step of the process: from Commercial Crew, to Orion/Space Launch System (SLS), to the efforts in preparation for operations in the cislunar Proving Ground, to human exploration farther into space than humans have ever gone before. Operations beyond the distance where crew are only hours away from "home" to where they may be months or years on their own require conquering many technical and operational challenges. This is both extremely difficult and exciting. It has many rewards for the future—in technology; national security; our economy; science, technology, engineering, and mathematics (STEM) education; and the collective enthusiasm of our population.

Dr. Sanders noted that one set of discussions the Panel had with Ms. Robyn Gatens, Deputy Director, International Space Station (ISS) Division, NASA Headquarters, illustrated how hard this journey will be. Ms. Gatens leads one of the System Maturation Teams (SMTs) that have been assembled to tackle the technology gaps in reaching NASA's exploration goals. Her team is addressing life support systems for extended space travel. The Panel was encouraged by the detailed effort that is ongoing to identify the specific technical gaps and the attempt to outline a roadmap to close them. The Panel also recognizes that there is much more hard work to do, and resources will need to be applied to successfully reach the goal.

At this point, Dr. Sanders turned the discussion on the next topic over to Dr. Donald McErlean.

Commercial Crew Program (CCP)

Dr. McErlean reported that the Panel had an excellent opportunity to meet in a focused session with Ms. Kathy Lueders, NASA CCP Program Manager, and her team. The ASAP also received a Program update at the general fact-finding meeting. The Panel continues to be impressed with Ms. Lueders' leadership and the capability of the entire team. The first question that was posed by the Panel concerned the certification program, which is sometimes called "human rating." The Panel was able to review the process and the planning for that process about a year and half ago. Dr. McErlean stated that it is gratifying to see the progress since then. The Program is maintaining action according to plan and moving ahead. However, there is still considerable work to be done. They are progressing in the certification program in accordance with CCT-PLN-1120, which contains the requirement for the contractor to "employ a robust safety review process." They have implemented such a process with the providers and have utilized a phased safety review process. Phase 1, which includes typically Preliminary Design Review (PDR)-level work, has been completed successfully. They are nearing the latter part of Phase 2, a Critical Design Review (CDR)-type process, which includes both spacecraft and launch vehicle as well as the interface with the International Space Station (ISS). All of the requirements are being considered. Phase 3 is what would typically be called the verification phase—where the providers will present to NASA the data they have accumulated for verification of requirements—and a judgment will be made as to whether the providers have met the requirements. Dr. McErlean emphasized that the CCP is making excellent progress, is on track with the plan, and is not sacrificing any particular risks to move forward. Challenges remain for both providers, but those challenges are being worked, and there is no reason to believe at this time that they will not be satisfactorily resolved. This is a critical element of the safety review process because it provides the necessary verification and closure of safety requirements that are levied on the Program.

The Panel also reviews the process in general within the CCP. The traditional scope of NASA requirements had been levied against the providers. The providers reviewed those, and based upon the fact that those requirements can be met in several ways, the providers presented to NASA how they propose to meet them. Where their approaches were different from the traditional NASA approach, there was a formal review by the TAs and subject matter experts within the Agency. That evaluation and decision required a formal signature by NASA that the provider's proposed mechanism or approach resulted in equivalent risk. All of that work is nearly completed (well over 90 percent). The Program team, the TAs, and the engineering community do not believe that anything beyond equivalent risk has been accepted. All of this is covered in CCT-REQ-1130, which provides

for the generation, assessment, and approval of any hazard analysis. Where hazards are identified, the provider creates a hazard analysis (including safety risk and mitigation strategy) and presents this to NASA for review and approval. That process is moving ahead. They are in high 70th percentile of completion. The ASAP was able to review a few representative samples. The providers understand the kind of data information that must be submitted for hazard analysis. The ones the Panel reviewed were very complete, and progress in this area is very satisfactory. The providers are clearly on board with the process and support it, providing NASA with excellent insight. The process is both robust and efficient enough to lead to certification of these systems for human use. Dr. McErlean emphasized that considerable work remains, but progress to this point, as well as the providers' transparency, has been excellent. The NASA team is doing an excellent job ensuring that the Agency's interests are taken into account and that unmitigated risks are not being accepted.

Dr. Sanders introduced CAPT Brent Jett, who reported on what the Panel learned about asset protection.

Asset Protection

CAPT Jett noted that the Panel's interest in asset protection (cyber security) has been ongoing. The ASAP conducts a number of insight visits throughout the year, and those visits have provided the ASAP with information on NASA's cyber security plans and implementation at the various Centers. The briefing received at this meeting was a culmination of what the Panel has learned throughout the year and what the Agency is doing. Everyone's awareness of cyber threats has been increased. The nature of how NASA does business leaves it more vulnerable to cyber attacks. The Panel had good presentation from Mr. James Leatherwood, who is the new Principal Advisor, NASA Enterprise Protection Program, and advises Mr. Robert Lightfoot, NASA Associate Administrator. He was accompanied by Ms. Michele DiGiuseppe, who leads the Space Protection Group for Human Exploration and Operations. CAPT Jett noted that there is a lot about cyber security and asset protection that cannot be discussed at a public meeting, but there are some important things that the Panel learned that can be discussed publicly.

NASA is taking a holistic approach to asset protection. For NASA, there are three elements—space asset protection, cyber security, and critical infrastructure on the ground—that are linked together. In the past, NASA had been treating them independently. The identification of Mr. Leatherwood as Principal Advisor and grouping all of this under "Enterprise Protection" brings everything together. Although it is called the Enterprise Protection Program, it was noted that this is not really a program in the traditional sense—it is more of a TA, although not formally established as such, and NASA is using the same structure. The Panel was gratified to see that NASA is taking holistic approach and starting down the path of putting in the management policies and practices to have an effective Enterprise Protection Program. They did admit that they have some challenges--getting away from past practices, integration, etc. One of the biggest challenges in having an effective program is having appropriate clearances for the appropriate people in NASA who make decisions to protect the Agency from threats. They need to have to have a level of clearance necessary to understand the threat and make the proper decisions. This has been a challenge for NASA. A system to work around these difficulties has been put in place, but it is not optimum. This is an area where NASA needs to focus.

The second area that they still have challenges in is resources and implementation. This is an area that the Panel will continue to watch. Overall, the fact that NASA is addressing the issue with a holistic, integrated approach and appears to have a good team in place, at least at the leadership level, to carry out the task is encouraging. The issue of security clearances needs to be addressed with a high priority.

The Panel agreed on the following formal recommendation on asset protection:

The ASAP recommends that NASA make it a matter of policy that priority is given to obtaining the appropriate level of security clearance for all personnel essential to implementing the Enterprise Protection Program, including the appropriate program managers.

CAPT Jett added that this may sound obvious to some people, but the key part of the recommendation is the priority. When a new program manager is coming online, if that person does not have the appropriate security clearance already, filling out the necessary paperwork to get it may not be high on the manager's priority list. NASA needs to make getting the paperwork completed and submitted a high priority. A manager should not move into a position until he or she has at least completed and submitted the paperwork.

Mr. John Frost added that some programs will have more priority than others. Low-level programs with very little risk may not need as high a clearance or need it as quickly; others may need it immediately at a very high level.

Dr. Sanders introduced Mr. Frost and CAPT Jett, who addressed the Exploration Systems Development (ESD) topic.

Exploration Systems Development (ESD)

CAPT Jett noted that there were actually two pieces to the ASAP's review: CAPT Jett and Mr. Frost did a focused session on certification, and then the Panel received their normal presentations. During the focused session, they met with Mr. Bill Hill, Deputy Associate Administrator for ESD in HEOMD, and six or seven key members of his team. They spent most of a day talking about their approach to certification for human space flight and the process for risk acceptance, with examples. CAPT Jett and Mr. Frost also looked at the hazard report maturity throughout the Program.

CAPT Jett noted that in terms of certification, there are three basic parts called out in NPR 7123 (Systems Engineering Processes and Requirements): design certification, system acceptance, and flight readiness. In the perfect world, those three phases should happen serially. In reality, however, it almost never happens that way. In ESD, because of the schedule, their plan has some significant overlap between design certification and system acceptance. This is not unusual, but the amount of overlap is more than one would usually see. However, NASA has gone to great lengths to ensure that everything is covered and there are no "gaps." In general, the Panel was pleased that NASA has covered everything, although the Program recognizes that there are some challenges from the complexity in how they are doing business. The Program Managers readily admit that there is some programmatic (not safety) risk to doing things this way, e.g., they specifically mentioned that the ESD tailored approach has design and acceptance activities overlapping, and not completed before the integration review, which is the last part of the acceptance review, nor, in some cases, before the flight hardware is in the Vehicle Assembly Building (VAB). However, from the Panel's perspective, everything appears to be covered. In terms of risk acceptance, the Panel's goal was to look at a specific example of a NASA decision involving risk acceptance and see how that process worked. CAPT Jett and Mr. Frost were looking for several things: adequate documentation of what alternatives were considered, the rationale for the ultimate decision, and a single signature accepting residual risk. The example they examined was the European Space Agency (ESA) Service Module (SM) single point failures. This issue was noted in ASAP's 2015 Annual Report. The Program had significant discussions about what to do about some of those single point failures. There were some dissenting opinions that were elevated appropriately through the TAs and discussed. Eventually, a plan was put into place that everyone agreed to, including those with dissenting opinions. The plan went forward to Mr. Hill and was briefed to Mr. William Gerstenmaier. Mr. Hill made the ultimate decision, and he showed the Panel the decision memo, which was very well done. Although CAPT Jett and Mr. Frost made some minor suggestions to potentially

improve it, the decision memo that they reviewed was exactly what Panel has been advocating and looking for in terms of a documented risk acceptance decision.

Mr. Frost commented that for a number of years, the Panel has been looking carefully at the risk acceptance process and has found that invariably, NASA looks very carefully at risk in a very analytical way, but typically, it has been in a committee environment. On many occasions, the Panel has asked to see the risk acceptance document, and it would be committee minutes or a letter from a contracting officer. The Panel has made this a focus, because many of the Panel members from different agencies or industries have found that very clear risk acceptance responsibility and single signature carries a lot of weight to move toward safety. In this instance, a random event was selected, and what CAPT Jett and Mr. Frost saw was a very crisp, well-written document that considered alternatives, clearly identified risk, and was signed properly. The Panel felt that this is a milestone and presents a good example for the rest of the Agency.

CAPT Jett noted that they also looked at the maturity of hazard reports. He and Mr. Frost examined six to ten reports in detail—ranging from cross program hazards that get elevated because they involve multiple programs, and program-specific hazards that get elevated because of the consequence score. Again, the Panel was very pleased with the hazard reports—the detail, the mitigation strategies, and the amount of work done. It was a very positive sign. Overall, this focused review was well worth the time, and the Panel believes that these focused meetings are extremely important.

Mr. Frost continued with his report on the normal ESD presentations and reviews. The Panel had a productive session with Mr. George Gafka, ESD Chief Safety and Mission Assurance (SMA) Officer. The Panel looked at the TA process for the Build-to-Sync (BTS) review that was recently completed. The BTS review is a CDR for three program elements that they need to ensure are tied together and “in sync” in terms of budget, schedule, and technical: Orion, the SLS, and the Ground Systems Development and Operations (GSDO). This BTS review focused on Exploration Mission (EM)-1. Mr. Frost commented that although the “M” stands for mission, this flight is not really a mission, it is a test flight. He emphasized that no one should forget that all of the early flights will be test flights. Mr. Gafka told the Panel that the ESD SMA has three functions at this point in time: independent reports and analysis that they perform, review of analyses performed by others (from the safety perspective), and formal Safety TA to ensure that the safety requirements are being met. SMA applied those responsibilities very successfully at the BTS review. They rated most of the program elements “green,” which signifies acceptable for this point in the program. They are still carrying Risk Management as green with a “tinge of yellow,” because the actual risk decisions are being made a little late in the program. They would like to speed that up, and the Panel agreed. The key is for the decision-makers to know about risks early enough to influence the risk decisions. The Panel applauded SMA for continuing to press that aspect. Ultimately, SMA concurred that the exploration system had adequately satisfied the BTS criteria and was ready to proceed.

The Panel received a status update from Mr. Hill on ESD progress. They are rapidly working through the design and build process, and have identified many successful milestones passed (reviews, tests completed). Mr. Frost observed that since the ASAP is a safety group, it focuses on where the hard spots are. In the Orion Program, the ESA SM is running behind schedule. NASA has put together a working group, that has worked the major issues and has identified a number of small changes that can get the ESA SM back on schedule. Another issue being worked is the crew module uprighting system. On Exploration Flight Test (EFT)-1, one of the flotation balloons deflated prematurely. These are the devices that ensure that the crew module stays in an upright and safe condition until recovery. Numerous design changes have been made to fix what happened there, but unfortunately, the Program is experiencing a different problem with seams leaking. This is not a technology issue, but it must be solved. There are several parallel paths under review to address the issue, and the Panel will follow this activity.

NASA provided a long list of accomplishments, some of which included completing the CDR, starting the build of the jettison motor for EM-1, and shipping the crew module pressure vessel. Mr. Frost pointed out that the ESA SM is part of the risk acceptance and resolution process. NASA identified a series of steps that would be taken for EM-1, EM-2, EM-3 and EM-4 to gradually improve that system. The team is finding that implementation of the improvements is not as easy as thought. They are more complex and will require more analysis. NASA may need to revisit whether the changes can be implemented for EM-1 and EM-2, and it appears likely that those changes may be delayed.

CAPT Jett noted that the changes mentioned by Mr. Frost are those changes to the propulsion system on the single point failure. This was the particular decision that the Panel reviewed, but the plan that everyone agreed to appears as if it might not be executable on the current schedule. The Panel will follow this issue closely. If the Program is not able to implement plan that was approved, it will revisit and document the decision.

With respect to the SLS, there have been numerous successes. NASA is pushing state-of-the-art hardware, particularly the welding of the liquid oxygen tank. The team is welding the thickest metal that has ever been attempted with the friction stir welding technique. It is working well on the hydrogen tank and a number of the seams in the oxygen tank. However, the team is having trouble with some of the seams, particularly where it is especially thick. There are several approaches to modify that, and the team will solve that problem before they proceed. Some examples of good news: the design certification review will occur in January 2018, numerous welds have been successfully completed, and good progress is being made toward flight hardware.

Mr. Frost reported that the GSDO appears to be making good progress all the way around. The VAB High Bay 3 is progressing, a number of the platforms have been installed, crawler modifications are being conducted, and Pad 39B is progressing. However, Mr. Frost cautioned that Hurricane Matthew could affect all of this. He noted that the Panel had previously commented on the need to not let schedule overly drive the Program. Mr. Frost observed that while schedule is critical, it is important not to let it push the Program into decisions that might be regretted later. The Panel will continue to follow the issue, and encourages NASA to watch this carefully.

With regard to the delay of the ESA SM, CAPT Jett added that although NASA does have schedule challenges, it is gratifying to hear that the first “rule” the team is given is “don’t cut content, don’t lose test objectives.” The Panel is hearing this from the ESD management; it is important that the working level understands that as well.

Dr. Sanders introduced Dr. George Nield, who reported on what the Panel learned from the ISS update.

International Space Station

Mr. Kirk Shireman briefed the Panel on ISS status. As usual, he started off with events planned on the schedule in terms of access to the Station, and there is quite a lot of activity. The next major launch is expected to be October 13 when Orbital-ATK (OA)-5 will be launched from Wallops Flight Facility, berthing with the Station two days later. In subsequent months, they expect to see the JAXA HTV-6 mission and SpaceX, which experienced a launch pad failure on September 1. That failure has put some uncertainty into their schedule, but SpaceX-10 is expected to come up once the failure investigation has been completed. Launch Pad 39A will be used for that launch. Soyuz has also experienced a recent problem—a faulty cable, which has been replaced and is being tested. The launch date for Soyuz is expected to be decided upon today, and it will be launched in the near future. Other events include extravehicular activities (EVAs) to change out the large solar array batteries (first time for this replacement), which is a very important activity. If things go well, the work might be able to be done in two EVAs, but plans are in place for six EVAs if required. The existing batteries are being replaced with a

newer, improved version – smaller, lighter, and more capable. Mr. Shireman reported that the existing batteries are probably good until mid- to late-2017, although it is hard to predict lifetimes on that type of hardware.

CAPT Jett noted that the Program pointed out that this battery replacement is very important. The batteries are coming up on an HTV scheduled for later this year. This critical resupply launch will be watched very closely.

Dr. Nield reported that utilization time has been going very well, and the Program is beating the targets. In terms of the Increment 49/50 plan, 304 investigations are planned, 120 of which are being sponsored by the U.S, 184 by the International Partners. One of the interesting investigations underway recently has been the Biomolecule Sequencer, initiated by NASA Astronaut Kate Rubins, that for the first time performed DNA sequencing on orbit. This investigation is going very well and should provide some additional capabilities for diagnosing diseases, identifying microbes, and understanding crew health on long-duration missions. It was also pointed out that the Biomolecular Sequencer investigation, along with several others, were used as test cases for an improved payload safety process. Payload processing has been a source of frustration over the years—it typically takes a long time and a lot of paperwork to get investigations approved for flight. NASA should be complimented for this initiative. Under the new process, NASA looks at an investigation at the highest levels. If the answers to two questions—Will this hurt the crew? Will this hurt the Station—are “no,” a streamlined approval process can be used to get an activity on orbit. This process is working very well for this type of experiment.

The Panel reviewed the information presented by Mr. Shireman on consumables—both for the U.S. segment and the Station as a whole—and those are looking very good. Mr. Shireman reviewed some particular vehicle issues, including the urine processing assembly and the best way to provide usable water. He also reviewed some of the issues experienced in EVA concerning water in the astronaut’s helmet. The most recent example was on EVA 35. The conclusion reached there was that the incident was not an example of the same failure as in the previous water-in-the-helmet instance. In this case, the likely cause was a combination of both environmental and operational factors that blocked outlet port slurper holes. The finding was that the amount of water was considerably smaller than before, and the conclusion reached was that this was a non-hazardous occurrence, even if it occurs in the future. As a result, the NASA team recommended a “go” for nominal and planned EVAs.

With regard to upcoming events, the OA-5 mission will return the Antares rocket to flight. This launch will be the first flight of the re-engined Antares. The Panel had a quick review of some of the hazards and risks that had been examined by the Flight Readiness Review (FRR) team: failure of a thrust-vector control actuator, a valve that didn’t close properly due to foreign object debris, and some unusual vibrations during throttle ramp-ups that were observed during stage test. Data had been examined for all of those, and the FRR team was comfortable that the issues had been addressed. NASA is intentionally not putting any irreplaceable cargo on this upcoming flight. The risks have been accepted and everyone is looking forward to a successful mission.

Several other interesting items were noted. The Commercial Resupply Services (CRS)-2 award in January 2016 selected both Orbital-ATK and SpaceX, and added Sierra Nevada Corporation (SNC) as a third potential provider for cargo. Work is underway to start the integration efforts to use all of these providers under this second phase of CRS. The Russians recently announced they will be going to a two-person crew instead of a three-person crew on Station starting in March 2017. The Program is comfortable that this can be accommodated, but there will be some impacts to both operations and training based on having one fewer crewmember on Soyuz launch and re-entry.

Before continuing with discussion regarding the End-Of-Life (EOL) planning, Mr. Frost commented on the Station batteries. Obviously, this is a very critical component. The Panel queried the Program about its contingency planning in the event of loss of the HTV. The Program is prepared; it has other batteries available and a production line is in place. The Panel was gratified to see good “what if” preplanning.

Mr. Frost noted that one of the biggest “what ifs” is what will be done if the Station has to come down sooner than anticipated. The Panel has been focusing on Station EOL – both planned and contingency. When the Station was launched, it was treated the way that all nations treated launched spacecraft at that time—that it would most likely come down over water or an uninhabited area, and that was the norm. Over the years, nations have become more conservative in their view of what risks are acceptable, and they have moved to the posture of having a specific plan for de-orbits. The ASAP has been pushing on this issue, and NASA has been working hard on it. The Program is getting closer to a resolution. The basic reference plan was agreed to in November 2014, and that is when progress really started moving. There is now a plan in place to use three propulsion modes serially to push the craft down into the atmosphere in a very controlled and precise way. The plan would start with the Progress main engine, then use the Progress R&D engines, and finally use the Service Module main engine to finish. For the contingency plan, there is a limited amount of time before things start to freeze, and actions must be taken quickly. That plan will look much like the nominal EOL plan. What they are doing now is working out the details years earlier than they would for a nominal EOL plan “just in case.” There was a bilateral Technical Interchange Meeting (TIM) between NASA and Russia in Houston in April. There is an EOL strategy document, and a contingency action plan has been jointly developed. NASA is coordinating the release of an Engineering Change Document (ECD), expected in November 2017. They are working carefully on a modification to reconfigure the FGB in the event of depressurization and are in testing this week. Mr. Frost stated that the best news is that they have now created a position for an EOL Project Manager, reporting directly to the ISS Program Manager, to focus on nothing but this activity, to ensure schedules are met, and to keep the pressure on.

Near the conclusion of the meeting, Dr. Sanders invited Mr. Hale to add any comments. Mr. Hale expressed appreciation for the opportunity to sit with the ASAP this week. He noted that many of the high-level interactions with the leadership were almost identical to presentations that had been made to the NAC, but the detail-level presentations and the nature of the interactions at the ASAP meeting were different. The policy of exchanging NAC and ASAP members for meetings is a good one, and the NAC appreciated Dr. Sanders’ participation at the last NAC meeting. Mr. Hale commented that it was very enlightening to think about these topics within a different framework than is normally done by the NAC.

Dr. Sanders opened the floor for public comments and questions; there were none.

Dr. Nield spoke briefly on an additional topic. He noted that the Panel has been hearing a lot from NASA leadership regarding the “Journey to Mars” and the plan for the future. Dr. Nield had the opportunity to attend the International Astronautical Congress recently, and there was a lot of interest from people around the world about what is going on in space and NASA’s ideas for the future. He commented that the NASA Administrator, the Deputy Administrator, and other senior NASA leaders are making a strong point that the Journey to Mars is not just a NASA plan, and that it is vital that there be international and commercial partnership involvement in the activities. Dr. Nield observed that there are a number of test launches taking place in the commercial world today. NASA leadership has made it clear, for example, that if there were to be a SpaceX interplanetary transport system developed and flying in a cost effective way, or if Blue Origin has a New Glenn or New Armstrong heavy lift vehicle that is demonstrated and is cost competitive with other systems, NASA could take advantage of those for the Journey to Mars. It is important to acknowledge and applaud these activities—it is not one or the other, or one country, or one space agency. The Journey to Mars will be a complicated effort, and

NASA needs to see where others can contribute. Mr. Frost added that it is a two-way street—they can help us and we can help them. It is a very synergistic environment.

In closing, Dr. Sanders commented that NASA and the Nation is on the verge of culminations in a number of programs. They are at the hard part where hardware, integration, testing, etc., are coming together. Although it is the hard part, it is also the rewarding part, where they will be seeing significant results. The ASAP looks forward to the next couple of years as things materialize in a very real way.

The meeting was adjourned at 11:12 am.

**ASAP RECOMMENDATIONS
Fourth Quarterly Meeting
October 6, 2016**

2016-04-01: Asset Protection – Security Clearance Policy

Finding:

NASA is taking a holistic approach to asset protection, linking space asset protection, cyber security, and critical infrastructure on the ground. The identification of Mr. James Leatherwood as Principal Advisor to the Associate Administrator and establishing an Enterprise Protection Program modeled after the Technical Authorities is a positive step. The Panel was gratified to see that NASA is taking a holistic approach and starting down the path of putting in place the management policies and practices to have an effective Enterprise Protection Program. While there are many challenges ahead, one of the big challenges to an effective program is having appropriate clearances for the appropriate people in the Agency who make the decisions to protect assets from threats. Currently, there are too many cases where security clearances are lacking. NASA has put in place a system to work around these difficulties, but it is not optimum.

Recommendation:

NASA should make it a matter of policy that priority is given to obtaining the appropriate level of security clearance for all personnel essential to implementing the Enterprise Protection Program, including the appropriate program managers.

Rationale:

The appropriate people in the Agency need to have to have a level of clearance necessary to understand the threat, make the proper decisions, and allocate the proper resources. When a new program manager is coming online, if he or she does not have the appropriate security clearance already, submitting the necessary paperwork may not be high on the new manager's list of tasks. NASA needs a policy to put a high priority on the submission of appropriate clearance paperwork.