

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

February 22, 2023

The Honorable Bill Nelson
Administrator
National Aeronautics and Space Administration
Washington, DC 20546

Dear Sen. Nelson:

The Aerospace Safety Advisory Panel (ASAP) held its 2023 First Quarterly Meeting in-person at NASA's Kennedy Space Center, February 7-9, 2023. We greatly appreciate the participation and support that were received from NASA's leadership, the subject matter experts, and the support staff.

The Panel submits the enclosed Minutes resulting from the public meeting for your consideration.

Sincerely,

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

Patricia Sanders
Chair

Enclosure

AEROSPACE SAFETY ADVISORY PANEL

Public Meeting
February 9, 2023
Hybrid

2023 First Quarterly Meeting Report

ASAP Panel Members Attendees

Dr. Patricia Sanders, Chair
Mr. William Bray
Dr. Amy Donahue
Lieutenant General Susan J. Helms, USAF (Ret.)
Mr. Paul S. Hill
Dr. Sandra H. Magnus
Dr. Mark N. Sirangelo
Mr. David B. West
Dr. Richard S. Williams, MD, FACS

ASAP Staff and Support Personnel Attendees

Ms. Carol Hamilton, NASA ASAP Executive Director
Ms. Lisa Hackley, NASA ASAP Administrative Officer
Ms. Ashley Rivers, Tom & Jerry, Inc, Technical Writer

[Appendix A – Teleconference Attendees](#)

Ms. Carol Hamilton, Aerospace Safety Advisory Panel (ASAP) Executive Director, called the meeting to order at 3:00 p.m. EST and welcomed everyone to the ASAP's First Quarterly Meeting of 2023, held at National Aeronautics and Space Administration's (NASA) Kennedy Space Center (KSC). Ms. Hamilton noted that the Federal Registry Notice gave the public the opportunity to send safety-related statements or to make opening comments prior to the scheduled meeting. It was noted that no such comments or statements had been submitted prior to the meeting, but time would be allocated at the end for public comments.

Dr. Patricia Sanders, ASAP Chair, thanked Kennedy Space Center for hosting the meeting and the support given throughout the week was greatly appreciated. She also acknowledged Dr. Sandra Magnus. Dr. Magnus' appointment to the ASAP expires soon and this was her last meeting as a member of the panel. For the past six years, Dr. Magnus has contributed valuable insight on multiple safety related topics of concern to NASA. Dr. Sanders expressed, on behalf of the Panel and the NASA community, that Dr. Magnus had been an amazing asset and would be sorely missed.

The ASAP 2022 Annual Report was released earlier this week. The report highlights both the progress toward the three strategic recommendations the Panel made the preceding year

as well as the remaining challenges, some of which were explored in the meeting this week. The Report also discusses some additional focus areas and is available on the NASA website.

As to the fact-finding discussions at this Quarterly meeting, Dr. Sanders first called upon Mr. William Bray, for the Panel's observations on the Artemis program.

On behalf of the panel, Mr. Bray congratulated the entire Artemis team on the successful launch and return of Artemis I: a job well done to NASA, the United States Air Force (USAF), and all its partners and industry teammates. Specific to the mission, all primary and secondary objectives were achieved, and system performance was nominal across key functional areas, and within required parameters. This type of performance enabled other objectives and tests to be included for additional data collection. As with any flight test, there were anomalies identified and the team is investigating for root causes and lessons learned as they prepare for Artemis II. The bottom-line is that the preparation, execution, and post-flight assessment of Artemis I is a great first step for the Artemis program and provides a great deal of learning and build-up of important muscle memory that will be necessary for the executional success of future flights and the overall long-term program. It is a great foundation to build on going forward.

The Artemis II team is using this success, knowledge, and momentum to immediately focus on the next flight test. They are recovering and refurbishing parts from Artemis I, initiating hardware build up, developing training plans for the astronauts, laying out the systems engineering, and integration plans necessary for success. It is very impressive to see the transition taking place towards Artemis II and the Panel looks forward to seeing that continued focus, discipline and rigor applied to that flight with safety and technical risk at the forefront.

Looking at Artemis III and beyond, several critical elements of the overall system are essential for Artemis Program mission execution and safety. Technical and acquisition risk should be closely monitored going forward. These systems, such as the Exploration Extravehicular Mobility Unit (xEMU) suits, the Human Landing System (HLS), and Gateway, provide critical functionality, have aggressive development and production schedules, and are dealing with highly complex technical challenges. The Panel does see continued progress and a good understanding of the issues and risks by the teams. However, with very aggressive schedules and the complexity of the technical issues, these elements will likely be on the critical path to the execution of Artemis III and beyond. A delay in any single one of these elements can create schedule delays or at minimum a loss of schedule margin. The Panel looks forward to continued dialogue and additional details of these elements; their ongoing technical and safety issues and risks; and their path to deliver integration and ultimate certification in future sessions.

Mr. Bray concluded with one last point relative to Lieutenant General (Lt. Gen.) Susan Helms' upcoming discussion on NASA's architecture efforts, a requirements trace specific to these elements from the updated architecture to elemental requirements would provide an important validation of engineering or integration requirements for the broader Artemis program.

Dr. Sanders followed up, stating that as always, with schedule pressure, the Panel cautions to not allow that to lead to unwise and unsafe decisions in the programs that endanger the crew and mission. Closely related to Mr. Bray's discussion is the Moon to Mars (M2M) Architecture and Technical Integration. Lt. General Helms was prepared to discuss this topic.

For the last several years, the Panel has emphasized the value of articulating an overarching strategic vision, leadership philosophy, and set of guiding principles that will chart a path for the Agency and its role in the future of space exploration. In addition, the Agency's priorities and processes should be clearly defined and communicated. The Panel believes this is extremely critical for NASA to best manage acquisition, safety, and technical risks as well as to inform future investment priorities for the Agency and its programs. Establishing a clear and broadly disseminated organizational strategy, aligned organizational structure, guiding principles, supporting processes, and priorities is essential for ensuring the workforce has a clear understanding of the lines of authority, accountability, and responsibility, and for promoting effective decision-making, risk management, and resource utilization aligned with Agency priorities.

In the 2021 Annual Report, the Panel outlined three strategic recommendations that are intended to provide guidance toward these goals. The 2022 report provided an update on how well the Panel thought NASA was meeting the intent of those recommendations. A lot of great progress has been made over the past year, including the 2022 Congressional Authorization language that directed the establishment of a NASA M2M program to be established under the Enterprise Service Desk (ESD) Mission Directorate; the release of NASA's 2022 Strategic Plan; and the release of the NASA M2M Objectives. The Panel remains a strong advocate of all the previously mentioned initiatives and remains interested in how NASA plans to take these initiatives to implementation of the Artemis Campaign.

This Quarterly, the Panel saw more notable progress by reviewing the status of architecture reviews, which provide the critical bridge between the M2M objectives and the overall performance and technical requirements for the Artemis campaign. Although considered somewhat of a living and evolutionary process, the architecture development processes of today are notably distinguished from their predecessors in a number of ways, including the following: it is now a logical progression from the M2M objectives; they identify and define capabilities and gaps for the campaign; they provide structure and justification for rapid prototyping; they allow for identification of areas where International Partners and others can contribute; they advise on evolving policy, budget issues, and development schedules; and they execute in a collaborative, fully transparent process involving Mission directorates, technical authorities, NASA centers and other experts in a federated board process, bringing their best recommendations to the Executive council.

In summary, the Panel was very impressed with the work of Ms. Catherine Koerner and her role in leading the Architecture Development office to ensure that this important function remains fully synchronized with the M2M objectives and the Artemis Campaign.

The Panel also notes that there is a lot of work being accomplished at the next level down, the Technical Integration of requirements that support the architecture. Fresh updates in capability requirements are in work and plans to close the gaps between current and future required capabilities are in development, including advocacy for investment. In summary, the M2M Objectives combined with the architecture development has really enabled the Artemis and M2M workforce to look upward at the big picture and align the local efforts to a strategic vision. This

is exactly the type of outcome that the Panel was hoping for in the articulation of the strategic recommendations.

In conclusion, Lt. Gen. Helms addressed looking forward toward other aspects related to the Panel's strategic recommendations. There are a few other focus areas to highlight as higher priority interest areas. Along with the alignment and integration of technical aspects of Artemis and M2M, the Panel is also interested in how NASA intends to align infrastructure and workforce to meet the challenges of the coming years. In keeping with Recommendation 2021-05-02 regarding the proposal for a Board-of-Directors-like strategic decision body, the Panel would like to better understand the role, charter, authority, and purpose of the Executive Council, along with other similar organizations within NASA, that are intended to be strategic decision bodies. In keeping with the strategic Recommendation 2021-05-03 regarding the need for a Program Office for the Artemis Campaign, the Panel fully endorses the intent of Congress to direct the creation of a NASA M2M Program and would like to stay informed of NASA's implementation of this congressional direction.

Dr. Sanders asked that Dr. Magnus address two related focus areas, the International Space Station (ISS) and commercial space activity in Low Earth Orbit (LEO).

The ISS program continues with its intense pace of operations and the Panel continues to be impressed with the level of activity and diligence to ensure the crew and vehicle continue to operate in a safe manner. There are several topics that touch safety that the Panel has been monitoring and will continue to monitor. Most recently of concern was the damage to the Soyuz vehicle on orbit which resulted in a leak of the coolant fluid. NASA, the Russian Space Agency (RSA), and SpaceX worked together to devise a crew return plan in the event of a contingency, and Russia is launching a replacement Soyuz shortly to replace the damaged vehicle. Kudos to the ISS program and SpaceX for acting quickly to ensure crew safety.

The panel has been following the investigation of the Service Module PrK leaks for some time. The investigation continues and again, kudos to the NASA and Russian technical and operational communities for working in what is evidently an extremely collaborative manner to drill down to the root cause of the cracks in the hull. The teams have been following investigative leads that include understanding the environment, structural loads, and material properties to reach the root cause. In addition, the operational community has taken steps to mitigate the leaks and continues to monitor the leak rate closely. In addition, the hatch between the PrK is closed when access to the service module (SM) aft compartment is not required. While it is still disturbing that the source of the cracks remains unknown, the Panel believes that the teams are managing the situation appropriately to maintain a safe environment on board.

The ISS program, across all international partners, continues to work on the required technical analysis and logistical planning required to ensure that the life extension of the space station is feasible, and all risks are understood. NASA has, for many decades built a robust sparing program and is leveraging that experience to anticipate problems that might arise from supply chain perturbations and hardware obsolescence, especially in the case of critical components. The Panel is still extremely concerned about the continuing viability of the ISS xEMU's, the space suits utilized for space walks. As mentioned before, the current suits are over 40 years old

and continue to exhibit signs of aging equipment. While the NASA team has been vigilant and aggressively manages the complex hardware by replacing, updating, and redesigning hardware, as necessary, the current suits can only be pushed so far. The new suits are needed immediately. It is not clear to the panel that the ISS replacement suit effort is receiving the resources it needs to expedite the delivery of a new suit to the space station, nor when the earliest date a new suit would be available, allowing NASA to retire an old suit. NASA is proceeding at risk by continuing to operate with the current suits.

In the 2022 fourth quarterly meeting, the Panel opened a new recommendation concerning the deorbit plan for the ISS. An earlier recommendation had been closed on the same topic with the understanding that a plan had been formulated and the teams were in the process of detailed development. At the fourth quarterly meeting it came to light that technical and operational difficulties required a different approach to deorbiting the ISS. Given the importance of being able to deorbit the ISS safely, either at the end of its life or in a contingency situation, the Panel opened the new recommendation which states that, “NASA should define an executable and appropriately budgeted deorbit plan that includes implementation on a timeline to deliver a controlled re-entry capacity to the ISS as soon as practicable to be in place for the need of a controlled deorbit in the event of an emergency as well as in place before the retirement of the ISS, to ensure that the station is able to be de-orbited safely.”

The Panel was pleased to see that the ISS program has made progress on this topic. A concept of operations has been developed which provides for a controlled deorbit. In the process, NASA has identified a critical new capability, a deorbit vehicle, that is responsible for the final deorbit burn that targets a safe re-entry. The agency has developed initial requirements and is discussing them with industry to scope the project. Given the normal complexity and timelines involved in developing space vehicles, the Panel applauds NASA’s efforts to date and is fully supportive of appropriate resources being allocated to implement such a program as soon as practical. In addition to the nominal deorbit plan, the Panel is still concerned about contingency deorbit capabilities. Given the increasing number of potential debris strikes that the ISS has been dealing with, several which invoked emergency procedures, the Panel encourages NASA to review and update such emergency plans. The Panel looks forward to receiving a presentation from NASA on such plans as part of the next ASAP meeting and to make this a part of continued discussions with NASA to understand their approach.

Dr. Sanders thanked Dr. Magnus and introduced Mr. Paul Hill to discuss observations of the Commercial Crew Program (CCP) with a focus on SpaceX.

Mr. Hill stated that SpaceX continues to keep flying and is clearly well integrated into the on-going ISS program, with Crew-5 on board and Crew-6 in the launch readiness review process. In the kind of contingency response that NASA has always made look easy, the agency and SpaceX did some fascinating work to provide contingency return capability on Crew-5 if it were to become necessary before Soyuz 69 arrives.

In future work, construction is underway to expand KSC Pad-39A to accommodate both Falcon-9 and Starship. Work has also begun to provide Falcon-9 support for crewed Dragon flights from

Pad 40 as a backup to 39A. They have been proactive in evaluating previous in-flight anomalies and for any corrective actions to future missions.

While the panel applauds SpaceX's great work, it is imperative to remember that in this business, it only takes one oversight to undo a long list of accomplishments and find catastrophic failure. The Panel encourages SpaceX to stay vigilant, if not paranoid.

Dr. Sanders directed the meeting onto the topic of the CCP with a focus on Boeing. The Panel continues to believe in the criticality of a second provider for crew transportation. Despite the reliable performance to date of the currently operating provider, SpaceX, there is no guarantee that a future failure will not occur as experienced with the Shuttle in the past. So, the Panel is interested in seeing Boeing, the long delayed second provider, in a position to provide services and to see the Crewed Flight Test (CFT) occur as soon as requirements to do so are met.

The Panel had the opportunity to review the open work remaining prior to CFT. The discussions this week illuminated that not all the NASA communities, such as the ISS Program and the Flight Operations Directorate, have the same perspective of the current risks as the Commercial Crew Office. This may not be unexpected. There were similar situations in the past with SpaceX such as Composite Overwrapped Pressure Vehicles (COPVs), and Load-and-Go, which were resolved and accepted after a series of tests and investigations that informed the NASA-wide risk acceptance decision processes. Given that there are differing views among NASA communities about crew risks for the Boeing vehicle, the Panel is very interested in learning more about the overall process for adjudicating those risks under the context of the Boeing service contract. What are the respective accountabilities for the contractor and NASA? How is that decision to be informed and with what supporting data? How do the various NASA communities express their voice on Boeing's risks? Would acceptance of the risk only be for CFT, or will it sustain for Post Certification Missions (PCMs)? The Panel has asked to see more detail about the risk acceptance process to be followed before a CFT of a Boeing vehicle.

As a first for the ASAP, time was spent with Space Communications and Navigation (SCaN). Dr. Sanders returned the conversation to Mr. Hill regarding this topic.

The Panel received a great overview of SCaN from Mr. Badri Younes and Mr. Philip Baldwin that ranged from capabilities to transformations for the future. This is NASA's 'one-stop shop' for space communication and navigation. Their work, like their historic contributions, has always been impressive from science missions to human spaceflight. SCaN is well underway to revising the near-Earth relay and the Deep Space Network (DSN) in support of existing program customers and Artemis, first for lunar orbit and surface services and then Mars. This includes an intentional push towards leveraging commercial services and establishing international interface standards.

It is encouraging that SCaN's development efforts are integrated into Ms. Koerner's Artemis architecture development. By all accounts, SCaN is on a great path.

Once Mr. Hill concluded, Dr. Sanders introduced Dr. Amy Donahue and the topic of safety culture and workforce.

A central focus at every meeting is NASA's safety culture, as the charter directs the Panel to advise the Administrator and Congress with respect to management and culture related to safety. At this quarterly meeting, the recent week of remembrance events sharpened the Panel's resolve in this regard as they joined the Agency to reflect on the tragedies of past losses, particularly on what has been learned over the twenty years since the loss of Columbia, and they continue to contemplate the complex challenges and opportunities ahead.

The primary question is whether employees, at all levels, feel free and able to raise safety and risk-related concerns, or whether they feel unable to speak up out of fear of retribution or professional risk. At this time, the Panel sees no evidence of the phenomenon known as organizational silence or pervasive suppression of open dialogue. Rather, they find executive leaders are genuinely committed to surfacing risk and safety concerns. Leaders can point to processes through which such feedback can and should be provided, to formal and informal forums where this feedback is sought, and to examples of dissent and debate where risks are examined, and decisions are vetted. Many with whom the Panel met confirmed their sense that Agency leaders welcome and want this type of engagement. At the same time, the Panel also hears feedback that encourages them to continue to interrogate this issue as there may be localized places where this is not working as well as it should. Furthermore, various dimensions of the present environment in which NASA operates make attention to the health of NASA's culture especially important. The Panel gave some attention to this in the recently released annual report.

At this meeting, the Panel had the opportunity to meet with Dr. Tracy Dillinger, who they've met with previously about the Organizational Safety Assessment processes and findings. At this meeting, they discussed the ongoing agency-wide survey work related to safety culture. It is understood that she and her team have recently completed the sixth round of a survey that has been used regularly since 2009. They are now in the process of analyzing those results and briefing their findings back to various levels of management. She described the results as generally favorable and tentatively confirmed the suspicion that there is no widespread or profound concern. This is bolstered by the Federal Employee Viewpoint Survey results, to which a high proportion of NASA employees respond, that have revealed NASA as the best place to work in the federal government for the past decade. Even with these favorable indicators, though, there may be places across the agency that would benefit from focused attention, and the Panel expects Dr. Dillinger's analysis of written comments employees provided will be revelatory in this respect.

It's worth noting that assessing safety culture is particularly challenging considering the context of NASA's environment, which shapes its safety culture. For example, NASA's culture interacts with the cultures of contractors, private providers, and industry and international partners. It is also affected by turnover in the workforce as experienced employees depart and new employees come in. The rhythm of flight operations such as the long period of time between Artemis launches and the high tempo of launches from the Kennedy Spaceport also influences what safety and risk "muscles" NASA exercises and how often. Unsurprisingly, perhaps the most prominent impact on safety culture is the ongoing effort to balance in-person and telework in the wake of the 2019 corona virus disease (COVID-19) pandemic.

The agency continues to grapple with how to return to working in person more without relinquishing some of the personal benefits individual employees gain from teleworking. NASA was able to accomplish a great deal remotely throughout COVID-19. In part, this is because the workforce had existing relationships on which it could rely. As people have left the agency and new employees have been hired, these relationships need to be rebuilt, which is difficult to do remotely. NASA has embarked on a “purposeful presence” agenda aimed to have people on site working together in person more to restore a holistic sense of community, connection, and shared purpose. Notably private provider workforces and contractors are generally in person on site. Across the agency, centers and subunits need to come to terms with which roles need to be in person and which can be remote. This will be a leadership challenge at the center level and below, as remote workers report high levels of satisfaction despite the costs in terms of team relationships.

To summarize, for now, the Panel’s conclusion is that, for the most part, people feel they can speak up, and when they do, they are heard. Even so, NASA is encouraged to stay vigilant and address even small pockets of concern they discover to ensure open communication grows ever more robust as a norm especially in the present dynamic environment. Along those lines, the Panel suggest leaders should proactively seek feedback from their employees in specific terms on specific decisions, not wait for feedback to come. In effect, an open-door policy is not as effective as a personal invitation.

Dr. Sanders directed the focus to Dr. Richard Williams for the discussion of health and medical.

The Panel met with Dr. J.D. Polk, NASA Chief Health and Medical Officer. Dr. Polk and his staff have been working with interagency partners on human space flight (HSF) mishap investigation policies and procedures. He has been coordinating with local authorities in the United States (US) jurisdictions with higher HSF mishap occurrence potential to pre-coordinate potential contingency responses. He has also been working with Irish medical and military authorities to plan contingency responses in case of a transatlantic commercial human space flight launch abort. His team will begin coordinating with international medical care systems across the potential Artemis launch azimuths to be prepared for the Artemis II mission. NASA health care authorities have been supporting the European Space Agency (ESA) as they stand up their para-astronaut program. Technology support for disabled persons, such as prosthetics and spacecraft compatibility, is being developed. Assuring ability for emergency egress is a major concern in this work. NASA is leveraging experience and precedent from the military and other agencies to inform this effort.

NASA is doing a lot of work in sharing space flight medical selection standards and medical experience with the commercial space flight sector and other agencies. The astronaut medical selection standards have been updated. The Health and Medical Technical Authority (HMTA) is making as many medical selection standards publicly available as possible to better inform the private, commercial, and international spaceflight industries. HMTA staff are expanding technical briefs on the Office of Chief Health and Medical Officer (OCHMO) website to inform industry and other partners while they develop medical technical briefs as well as clinical practice guidelines.

Long duration exploration class space missions will require NASA to adopt an adjusted construct when accepting risks around crewmember injury and illness. NASA has always planned to stabilize critically ill or injured crewmembers in LEO and evacuate them to ground based definitive care rapidly. This will not be possible in a timely fashion during Artemis missions and life and limb risk mitigation will become subordinate to mission risk mitigation. NASA will leverage policies developed over the past several years to consider and accept extraordinary health risks in long duration space flight. For example, a high space radiation dose risk is accepted by the crewmember and the Agency for mission completion.

NASA bioethics authorities have also recently strengthened and consolidated the Agency level Institutional Review Boards and Institutional Animal Care and Use Committees to better support human and animal research safety on the ground and in LEO.

Dr. Polk is supporting the M2M Architecture work and the HMTA is working on white papers to address specific health related risks. Crew health and medical support equipment needs to be as compact and light as possible to accommodate other mission imperatives such as planetary sample return. The HMTA is also working with planetary protection staff to address and prevent cross contamination potential.

From a global human space flight risk mitigation perspective, the HMTA is better staffed than ever before, and Crew Health Performance Officers are imbedded in programs achieving much better understanding of program dynamics. Health risks are defined earlier in programs, with positive impact, which is a great improvement in technical authority programmatic support. Finally, the NASA COVID management group will sunset with expiration of the public health pandemic emergency order on May 11, 2023.

Dr. Sanders commented that it is interesting to note the intersection of health and medical aspects of the M2M architecture, a credit to the thoroughness of that enterprise.

Dr. Sanders then opened the meeting for public comment. No comments were received.

In closing, Dr. Sanders thanked the Panel as well as all the NASA participants in the discussions for a productive and insightful Quarterly meeting. Dr. Sanders adjourned the meeting at 3:41 p.m. EST.

Appendix A

Teleconference Attendees¹

Alicia McPhail, *NASA HQ*
Alotta Taylor, *NASA HQ*
Antonia Islas, *Analyst*
Ashley Wilson, *House Science Committee*
Barbara Velon, *NASA*
Viana Oglesby, *NASA*
Brittani Sims, *NASA*
Charlie Scales, *House Science Committee*
Christina, *NASA JSC*
Craig Updyke, *ASTM International*
Dana Hutcherson, *NASA CCP*
Darcy Elburn, *NASA*
David Millman, *Affiliated*
Dillon Lavielle, *SpaceX*
Dimitra Tsamis, *NASA OIG*
Donald Wood, *NASA*
Eric Maier, *NASA JSC*
Erin Kennedy, *DAO*
Etienne Dauvergne, *European Space Agency*
Gene Mikulka, *Talking Space*
Heather Scott, *NASA*
Ivy Miller, *4th Grade Student*
James Matti, *Sierra Space Corporation*
Janet Karika, *NASA*
Jeein Fagedef, *NASA*
Jennifer Benjamin, *Sierra Space Safety Mission Assurance*
Jessica Londa, *NASA*
John Kirar, *Ball Aerospace*
John Shannon, *Boeing*
Josh, *Boeing*
Josh Finch, *NASA*
Joy Kin, *JAL*
Kathryn Hambleton, *NASA*
Kathy Dalton, *NASA*
Ken, *NASA*
Kyle Mowlin, *Boeing*
Lauren Seabrook, *Boeing*
Lindsay Eady, *Boeing*
Lora Bleacher, *NASA HQ*
Louis Grosswald, *Lockheed Martin*
Maria Montemayor, *Boeing*
Mark Carreau, *Aviation Week and Space Technology*
Mark Nappi, *Boeing*
Micah Maidenberg, *Wall Street Journal*
Michelle Green, *NASA*
Nicholas Vera, *Sierra Space*
Nicole Walters, *Origin Paralegal*
Phillip McAlister, *NASA*
Rachel Krast, *NASA Office of Communications*
Rebeca Regan, *Boeing*
Richard Grant, *NASA*
Russ DeLoach, *NASA*
Sarah McGrath, *NASA Office of Inspector General*
Stephanie Schierholz, *NASA*
Susan Sawyer, *CCP*
Tonya McNair, *NASA*
Trip Healey, *NASA CCP*
Tyler Mitchell, *NASA*
William Readdy, *ISS Advisory Committee*
Zudayyah Taylor-Dunn, *NASA*

¹ The names and affiliations are as given by the attendees, and/or as recorded by the teleconference operator.