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

June 5, 2023

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

Dear Senator Nelson:

The Aerospace Safety Advisory Panel (ASAP) held its 2023 Second Quarterly Meeting in-person at NASA's Johnson Space Center, May 23-25, 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,

Patricia Sanders
Chair

Enclosure

AEROSPACE SAFETY ADVISORY PANEL
Public Meeting
May 25, 2023
Hybrid

2023 Second Quarterly Meeting Report

ASAP Panel Members Attendees
Dr. Patricia Sanders, Chair
Mr. William Bray *(virtual)*
Dr. Amy Donahue *(virtual)*
Lieutenant General Susan J. Helms, USAF (Ret.)
Mr. Paul S. Hill
Mr. Kent Rominger
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 Mae, 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 4:00 p.m. CT and welcomed everyone to the ASAP's Second Quarterly Meeting of 2023, held at the National Aeronautics and Space Administration's (NASA) Johnson Space Center (JSC). Ms. Hamilton noted that the Federal Registry Notice gave the public the opportunity to send safety-related statements or to make 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 the leadership and personnel of JSC for the Quarterly insight discussions and support given throughout the week. She also acknowledged the participation of the most recent appointee to the Panel, Mr. Kent Rominger. Mr. Rominger brings key experience and perspective that the Panel welcomes.

This week, the Panel continued their focus on the strategic areas relevant to risk management that formed the basis of three key recommendations. With the high tempo of program activity, it would be easy for NASA to be consumed by the tactical aspects of day-to-day program execution. However, the Panel is encouraged by the amount of effort and progress that the Agency has made on strategic vision, communication, and governance. There is clearly an energy and an emerging alignment of leadership of mission directorates,

Center Directors, and mission support areas toward a shared outlook. The Panel, of course, did not neglect engaging with the ongoing nearer term items in the NASA portfolio.

Pertinent to strategic vision and alignment, the initial item for discussion was the Architecture for the Moon to Mars (M2M) Program. Dr. Sanders called upon Mr. Paul Hill to lead the topic.

Mr. Hill expressed that the Panel had another great discussion with Ms. Catherine Koerner regarding the Artemis architecture concept review process that was reviewed at the last Quarterly meeting. NASA's goal is to "architect from the right" in defining the architecture required to support the M2M campaign, meaning that objectives and goals define the characteristics and needs which then define the architecture (functions, elements, etc.). All of which were developed collaboratively, then reviewed and approved in a Flight Readiness Review-like (FRR), agency-wide leadership meeting.

The Architecture Concept Review (ACR) has been adopted as an annually recurring Artemis management process to screen for program gaps and disconnects in the M2M campaign which then informs direction and budget submits, both at the program and Center levels. Issues, overlaps, and duplicates would then be reviewed at the agency level in a normal, traditional management forum like the Directorate Program Management Council (DPMC), Agency Program Management Council (APMC), and/or Executive Council.

The focus, so far, has been on the "early phase" and elements of the lunar campaign. The Agency is doing the work now on the next iteration, ACR-23 and "Humans to Mars."

This ACR process directly addresses a significant focus and formal recommendations the Panel has made in the last two annual reports regarding agency governance and Artemis campaign management. It is fair to say that this sets an excellent standard for the management approach, process, and behaviors the Panel encouraged through those recommendations.

As such, the ACR is an excellent step in the direction of "operationalizing" this integrated and aligned way of managing within Exploration Systems Development Mission Directorate (ESDMD). The Panel further encourages the Agency to formally "institutionalize" the ACR process as a required Artemis campaign and M2M Program management process.

The Panel also urges the Agency to apply the same deliberate strategic management approach, process, and behaviors across the Agency for setting priorities; aligning the institutions and programs; managing execution; and adjudicating gaps, disconnects, and overlaps. The Panel further saw efforts by the Agency in mission support budgets, infrastructure, and workforce, indicating that the Agency is already moving in this direction more broadly.

The long-term litmus on success for both ESDMD, as an Artemis management process, and the Agency more broadly along with closure of the governance recommendation to the Agency will be: formal actions and direction resulting from the ACR process to resolve

gaps, disconnects, and overlaps in program and Center priorities, objectives, and resources all in alignment with agency level strategy and priorities; and performing organization programs and Center leaders are held accountable to perform accordingly.

The result of which is a fully integrated program where enterprise level technical and safety risks are identified and mitigated/resolved all in support of enterprise strategy and priorities.

Referring to two key points in the governance language from the 2022 Annual Report as a way of connecting them to the Panel's observations regarding the ACR process: set strategy and make related, ongoing decisions as a "board" consisting of key Headquarters "program" and Center leadership; and deliberately use the full and open forums to maximize transparency and engagement.

This first ACR applied both points through the collaborative development and vetting process which then led to formal agency level review and approval by a body that included all members of the agency level DPMC and APMC. Importantly, ESDMD plans to repeat this process annually, which is truly fantastic for Artemis and ESDMD. Accordingly, this would satisfy or close these two key points from this recommendation for Artemis: deliberate alignment to Agency goals by employing the "board" to make smart strategic resource choices across Centers, where the Agency's strategy and priorities are what is explicitly considered and supported; and expect Centers to then execute accordingly, bringing exceptions, new information, reclamas, et al. back to the "board."

Mr. Hill concluded that these two points are where review findings evolve into formal and strategically aligned program and Center action not just observations and intentions. The Panel encourages the Agency to formally codify this approach in Artemis management processes and across the Agency in general. This includes the expectation that this annual effort leads to program and Center direction and budget submits which the M2M Program Manager (PM) is clearly committed to do within Artemis.

Dr. Sanders asked General Susan Helms to address the M2M Program management and the status of Artemis.

Gen. Helms recalled The Panel's **Recommendation 2021-05-03**:

> NASA should manage Artemis as an integrated program with top-down alignment, and designate a Program Manager endowed with authority, responsibility, and accountability, along with a robust bottom-up, collaborative feedback process for both Systems Engineering and Integration (SE&I) and risk management.

Since the Panel's last Quarterly meeting, the M2M Program has been formally established, and includes the following elements: the Space Launch System (SLS) under section 20302 of Title 51 of the United States (US) Code; the Orion Crew Vehicle; the Exploration Ground Systems; an outpost in orbit around the Moon; human rated landing systems; spacesuits; and any other element needed to meet the requirements of the program.

The establishment of the M2M Program, effectively, seems to meet the overall intent of answering the Panel's recommendations. There is a new PM organization up and running that has the right focus along with the right program and technical integration. The SE&I,

integrated risk approach, philosophy, and processes appear to all be spot on. There is a focus on integrating elements and understanding System of Systems (SoS) risks and critical path items. The Panel recognizes the results of integrating engineering best practices and the processes developed over the last several years within the Agency. The Panel understands, and hopes the Agency does as well, that while on the right path, this type of organization needs time to mature.

In the Panel's 2022 Annual Report, one of the key risk management challenges addressed was the split authorities between Artemis development and Artemis operations directorates. Given that the M2M Program now has an integrated development and operations PM, this now appears to be mitigated as a concern.

There are still some challenges the Panel would like to explore, as it is still early in the establishment of the M2M Program office. For example, NASA has historically had a prime integrating contractor for their previous International Space Station (ISS) and Space Shuttle Programs to manage integrated risk across subprograms and projects. How is the M2M Program achieving a similar risk management capability in the absence of a prime integrating contractor? Another watch item for the Panel is the unprecedented mix of acquisition approaches upon which the M2M Program office will rely and how that mix will present risk management challenges. As the Program Office matures its processes, the Panel plans to explore this subject in more detail in the future to see how the Program Office is mitigating this challenge.

The Panel was briefed on the completed data analysis of Artemis I. Lessons learned have been identified and are being incorporated into the Artemis II processes. All In Flight Anomalies (IFA) are being systematically worked and several Tiger Teams have been established to address critical forward work for Artemis II including the heat shield post-flight analysis, pad access, ground integration, hydrogen leak reduction, and others.

Regarding Artemis II: the crew was announced; the hardware (HW) is mostly complete; mating in progress; the HW/Software (SW) systems integration and test plan is laid out and ready for integration; and the launch and recovery Concept of Operations (ConOps) are/is in development. An issue with the Orion hatch was brought to the Panel's attention and given the importance of its role in necessary crew escape modes, the Panel plans to request further detail in a future meeting. As for Artemis III, the Panel understands that the Human Landing Systems (HLS) Starship and the Extravehicular Activity (EVA) suits remain on a critical path.

In closing, Gen. Helms summarized that as the new M2M organization matures, developing a campaign with a regular cadence of flights is important along with realistic schedules and realistic mission test objectives.

Dr. Sanders added that the M2M Program management structure is less than two months old, so there clearly is a lot of work needed to get achieve program execution maturity, but the PM has well defined the tasks ahead to evolve to the desired risk management posture. This is a critical first step.

The Panel's strategic recommendations placed emphasis on a NASA governance that focused the Agency leadership, both mission and Center, on a shared and aligned "one NASA" path for the Agency's mission. Dr. Sanders requested that Mr. Hill remark on the Panel's observations regarding the progress being made in that direction.

Mr. Hill made statements on the strategic workforce. Following in a similar logic path as the ACR, the Agency has several related activities in work to take a deliberate look at "what we have" versus "what we need" from an integrated enterprise perspective. The process is intended to build alignment on objectives, priorities, and requirements to inform mission support budgets, infrastructure, and workforce planning.

Like the ACR process, the Panel sees these efforts to have the potential to be critically enabling for the Agency. In the areas of support budgets, infrastructure, and workforce planning, the collaborative efforts NASA is using to assemble meaningful data will significantly improve transparency and consistency across Centers and programs. Like the ACRs are expected to achieve for Artemis, these efforts could lead directly to an unprecedented ability for Agency leadership to resolve gaps, discrepancies, and duplication per Agency priorities, thus optimizing NASA investment to achieve enterprise level priorities. To some, this description may sound like bureaucratic detail, but it isn't. It is mind-blowing, as evidenced by just one of many quotes by a Panel member today that, "This is beautiful!"

As these efforts move from assembling and studying the data to formulating conclusions and recommendations, they will be key in shifting from ten separate, and sometimes conflicting, Center plans to a mission driven, agency master plan with a full portfolio prioritized to support NASA's missions.

The Panel applauds the Agency's efforts in evolving this management focus, which, like the ACR, is exactly aligned with the Panel's governance recommendation. Again, it will be key to codify this enterprise-priority driven evaluation process and adopt it in formal NASA management. Included in that recommendation is the expectation that these recurring efforts lead to program and Center direction and budget submits through NASA leadership forums like the DPMC, APMC, and Executive Council.

There's a telling anecdote from the Agency's 3-day ACR meeting that the Panel heard from more than one participant. The first day was tough as this large assembly of senior NASA leaders struggled through a new type of scrutiny of their most critical Artemis strategy and program plans, ending with some wondering if they could get there. On day two, there was a shared sense that the effort was coming into focus, and more could see where this was leading. Day three ended with a sea change in alignment and sense of purpose that persists still.

This is exactly what the Panel is encouraging. As written in the 2022 Annual Report, "Governance style plays a critical role in deliberately sending signals from the top-down and setting or reinforcing cultural norms at all levels that can strengthen or weaken team performance." As NASA codifies these efforts into their ongoing management processes,

that is also what they are doing. They are deliberately setting that transparency, alignment, and sense of purpose that all do so much to strengthen their risk management and mission success.

The Panel looks forward to seeing results of the next steps towards what has all the potential of leading to a paradigm shift in aligned NASA leadership and management effectiveness.

Dr. Sanders then directed the conversation to another critical ongoing operation of the Agency. She asked Dr. Richard Williams to report on the Panel's engagement with respect to the ISS.

Dr. Williams led the discussion on the ISS, stating that the ISS Program continues a very challenging, sometimes frenetic operations tempo, managing an array of visiting crew transport vehicles, resupply vehicles, EVAs, and limited launch pad availability while maintaining a high degree of safety. The Panel is pleased to hear that communication and collaboration between Russian and US programmatic personnel has continued in a highly professional and productive manner, in keeping with the long history of cooperation and mutual support in human space flight between Russia and the US.

There are several ongoing issues and concerns that the program, and the Panel, are monitoring carefully.

Included in those concerns are coolant leaks in a Soyuz and similar coolant leaks in a Progress resupply vehicle. The contingency plans to return Astronaut Frank Rubio in a Dragon spacecraft are in place if necessary. The cause of the leaks has not been definitively identified at this point. Program personnel continue collaborative support in the ongoing investigation.

Another ongoing issue is the Russian Service Module PrK leaks. As noted previously, several hull cracks have been identified and repaired in the Russian Service Module, and several other areas have been identified that might be contributing to the very slow leak rate from the module. All cracks are small, show no sign of propagation or potential for structural compromise, and are currently not thought to impact structural life. Investigations are proceeding to identify possible causes of the leaks, with US support. Repair materials and data for testing and analysis are being shared freely between the ISS partners. The Panel remains confident the ISS team is managing the situation to maintain a safe environment.

As far as the ISS life extension is concerned, analysis of the primary ISS structure to assess remaining life is ongoing. Logistics needs and spares assessments are also ongoing. NASA, Canadian Space Agency (CSA), European Space Agency (ESA), and Japan Aerospace Exploration Agency (JAXA) have agreed to an extension of ISS Functional Availability to 2030. Roscosmos has received government approval to extend through 2028. NASA anticipates completion of its ISS life extension analysis by late 2027. The Panel would like to see a more detailed briefing on the ongoing life extension analysis at its next Quarterly meeting.

The ISS Program released a draft Request for Proposal (RFP) in May 2023, to develop a US Deorbit Vehicle, with a final RFP expected later this summer. The US Deorbit Vehicle will be capable of executing final safe deorbit of the ISS. It is anticipated the Russian Segment will continue to provide attitude control and altitude lowering in preparation for deorbit. The Panel is pleased to see activity towards US deorbit capability, and sees this as initially responsive to the recommendation made in late 2022 to: "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 deorbited safely."

Regarding the second US crew transportation provider, the ISS Program is following preparations for the Boeing Crewed Flight Test (CFT) Mission closely and anticipating eventual availability of a second US crew transportation capability.

Recent developments necessitate the Northrup Grumman (NG) Cygnus vehicle changing from Antares to Firefly as a launch vehicle. In the interim, NG-20 is planned to launch on a Falcon 9 vehicle, which increases competition for launch pad access at the Kennedy Space Center. Interruption in launch vehicle redundancy is a top concern for the ISS Program.

The Panel continues to be concerned about the aging Extravehicular Mobility Units (EMUs) on the ISS. NASA has awarded Collins Aerospace Exploration EVA suit ISS design and development responsibility through Critical Design Review (CDR) with options through on-orbit demonstration. Axiom, awarded the EVA suit contract for the Artemis lunar missions, has also scoped ISS usage for NASA consideration. Internal NASA work to develop and maintain EMU capability to support transition to the new suits continues, to ensure US EVA capability remains available. While the Panel is pleased with these efforts, the Panel retains a sense of urgency to replace the existing EMUs as soon as possible.

Dr. Williams concluded his discussion by stating that the Panel remains extremely impressed with ISS Program performance and compliments the ISS team for ongoing excellence in a highly complex and demanding operational environment.

Dr. Sanders requested Mr. David West to initiate discussion of other activities related to Low Earth Orbit (LEO), especially commercial activities.

The Panel had an informative discussion this week with Ms. Angela Hart, the Manager of NASA's Commercial LEO Development (CLD) Program, Mr. West stated. The program is very active, and the providers Axiom, Blue Origins, Nanoracks, and NG of LEO Destinations have logged several significant accomplishments since the Panel's last Quarterly meeting. Several design and programmatic reviews have been held. To be commercially viable, it will be necessary for providers to present strong business cases for the LEO platforms they are developing. Also, to be successful, the customer base for the LEO destinations will need to include more than just NASA.

In addition to the status of the various CLDs, Ms. Hart talked with the Panel about collaborative efforts to develop commercial space capabilities, which will provide meaningful benefits to human spaceflight. Several Private Astronaut Missions (PAMs) are in various stages of planning and completion. In fact, four astronauts were launched this week in a SpaceX Crew Dragon capsule atop a Falcon 9 rocket. Commander Peggy Whitson, Pilot John Shoffner, and Mission Specialists Ali Alqarni and Rayyanah Barnawi are currently in orbit for the Axiom Space 8-day PAM-2 mission at the ISS. After the completion of PAM-2, lessons learned will be incorporated into subsequent PAMs. An RFP was released in September 2022 for PAM-3 and PAM-4. PAM-3 was awarded to Axiom Space earlier this year. The award of PAM-4 has not yet been announced.

Ms. Hart and her team are to be commended for successfully working out the launch window for PAM-2 despite a very challenging series of schedule constraints affecting ground processing, launch, and ISS availability.

Regarding the design and development work being done on the CLDs, the Panel had questions about how the safety risk of these platforms will be managed. An overall Safety and Certification Strategy is being developed and is expected in early 2024. NASA will require a rigorous safety review process for the CLD providers, but for each provider, it will be their safety review to conduct. In general, the Panel is concerned about who in the government will manage safety and certification of commercial space activities for the nation, in terms of policy and legal frameworks.

One of the top concerns of the CLD Program is the possibility that fully functional, free-flying destinations may not be ready before the ISS needs to be retired and deorbited. This would result in an undetermined length and time during which NASA and commercial customers would have no access to LEO. The Panel had an extensive discussion about this concern and bought up several questions for consideration. For instance, to what extent is LEO access required for conducting research that would reduce the risks identified with the M2M Program? What are the drivers, and where are the programmatic gaps that could threaten the success of a research-based risk reduction plan for the M2M Program?

The Panel is concerned that consideration of another extension to the life of ISS might be required to protect continuous US presence in LEO, but eventually, that will no longer be an option. If ISS life extension is not possible or not advisable for economic, risk management, or other programmatic reasons, then plans for deorbiting ISS in that situation need to be finalized and agreed upon, and contingency plans for being without LEO access need to be developed before the situation becomes time critical.

Mr. West concluded his points stating that this is a complex and evolving scenario, and through the Panel's upcoming Quarterly meetings, the Panel will be closely monitoring all the interrelated considerations and decisions.

Dr. Sanders led the conversation to the Commercial Crew Program (CCP). With so much attention focused on the M2M efforts and ongoing operations in LEO, there are still some very critical crew transportation endeavors occurring through the CCP. With the regular

crew rotations to ISS, it would be easy to consider this as an area of risk that is well understood. However, it remains an endeavor that requires standing vigilance if there will continue to be safe and reliable crew transportation.

SpaceX, to date, has been providing crew transportation services to the ISS on a regular cadence, but this is not time for complacency with that performance. Despite, or even because of the number of successful Falcon 9 and Dragon flights for NASA and many other customers, the Agency should not get unduly confident in that performance. There have still been IFAs that, so far, have not degraded mission accomplishments, but should be ongoing reminders that risks remain.

In recognizing the importance of redundant US crew transportation as a valuable goal there should not be impatience in certifying a second provider until certification requirements can be achieved. There is a long line of NASA processes still ahead to determine launch readiness and the Boeing CFT should not be flown until safety risks can either be mitigated or accepted, eyes wide open, with appropriately compelling technical rationale.

While there is a projected launch date for CFT, this date represents an opportunity in the launch schedule and ISS manifest, and not necessarily an acknowledgement of readiness to conduct the flight test. In fact, there are several open risks, some long standing, and including some recently revealed through analysis of recent deliveries of certification verification products. Parachutes remain a pacing item for certification. Integrated SW testing is still ongoing. Battery sidewall rupture has not yet been mitigated, although that risk has been accepted for the interim, not the long term.

It is imperative that NASA not succumb to pressure, even unconsciously, to get CFT launched without adequately addressing all the remaining impediments to certification. And where a deliberate and technically supported decision is made to accept a risk for CFT, the Panel believes that a decision to accept a risk for a specific, short duration mission should not be justification for continued acceptance of that risk for subsequent missions because “it worked for CFT.”

Given the number of remaining challenges to certification of Starliner, the Panel strongly encourages NASA to step back and take a measured look at the remaining body of work with respect to flying CFT and to consider seriously having an independent team, perhaps the NASA Engineering and Safety Center (NESC), take a deep look at the items on the path to closure.

Moving to the last topic of the day, Dr. Sanders asked Mr. West to touch on safety culture, a very important, ongoing concern for the Panel.

Mr. West began by stating that for several years, and over the course of several Quarterly meetings and Annual Reports, the Panel has been reviewing NASA’s awareness of, and efforts to mature, its safety culture. This week, the Panel engaged in a discussion with Dr. Tracy Dillinger, NASA’s Safety Culture Manager. Dr. Dillinger shared results of round six of the Safety Culture Survey (SCS), which was completed by all Centers as of November of

2022. The SCS has been administered every two years for about twelve years to both civil servants and onsite contractors. This latest round of the survey saw a high level of participation, with over 26,000 respondents. NASA has incorporated requirements for administering the survey into NASA Procedural Requirement (NPR) 8705.6D. It is evident that senior leadership across the NASA Centers is highly engaged in the survey and its results.

In general, NASA's scores on this survey were particularly high, with an average of 5.26 on a 6-point scale. It is worth nothing that NASA also scored high on the Office of Personnel Management (OPM) mandated Federal Employee Viewpoint Survey (FEVS). NASA is consistently rated as one of the best places to work in the Federal Government. The challenge for NASA and Dr. Dillinger's team is to meticulously scrutinize the comments provided by respondents, particularly for those areas rated the lowest, from among the general high scores received, to help craft corrective actions. Dr. Dillinger made the point that measuring the safety culture doesn't change the culture; however, NASA does want to shape the culture.

The results of the survey were analyzed across several different subgroups, including by NASA Center: by whether the respondent works remotely, onsite, or by telework; by the number of years the respondent has worked at their Center; by mission directorate; and, for some directorates, by program. For questions that identify employees' employment level and occupation, respondents could indicate that they preferred not to answer. An interesting but not necessarily surprising phenomenon was that those who chose not to answer these questions would typically give ratings of about a half-point lower, on average.

Another continual challenge with analyzing the results of the SCS is determining whether the comments submitted by respondents provide any indications of organizational silence; that is, whether there is any reluctance to speak up about safety concerns. The Panel will be particularly interested in learning whether there are any specific safety concerns that respondents may have, but that just are not widely shared. For example, the Thermal Protection System concerns for Columbia that were under-communicated at the time.

Mr. West concluded with a comment that, in discussions this week, the interesting suggestion was made that NASA should involve and get buy-in from younger workforce members in efforts to positively shape the Agency's safety culture. The Panel thinks this suggestion has merit and looks forward to seeing how the Agency decides it might act on this suggestion.

A recurring theme Dr. Sanders noted throughout the meeting was the high tempo of the Agency and the workload pressure. This remains a watch item for the Panel.

Two members of the Panel were unable to travel to this meeting due to family or professional commitments, but both individuals participated virtually and while they are not in the room with the rest of the Panel, they are present and are provided an opportunity to add any observations to what was already noted. The floor was opened for Mr. William Bray and Dr. Amy Donahue for comments.

Mr. Bray and Dr. Donahue both reiterated the importance of remaining vigilant regarding safety risks, touched on topics previously discussed such as the ISS and EVAs, and applauded the efforts of the visible changes associated with the Agency's attempts for an improved safety culture and alignment, all of which lends itself to mitigating and/or eliminating safety risks.

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

In closing, Dr. Sanders stated that the Panel is mindful that safety vigilance must be a constant. The word "comfortable" should never be in the lexicon when talking about space flight. The risks are always present. Everyone need to continually ask themselves, "what did we forget that will result in loss of crew or mission tomorrow?"

Dr. Sanders adjourned the ASAP Second Quarterly meeting of 2023 at 4:41 p.m. CST.

Appendix A

Teleconference Attendees[1]

Abhi Tripathi	*Interested Party*
Amit Kshatriya	*NASA*
Ashley Wilkins	*House Science Space & Technology Committee*
Brittney Thorpe	*NASA*
Carrie Rogers	*GAO*
Catherine Williams	*Boeing*
Danyel	*Public*
Darcy Elburn	*NASA HQ*
David Gallus	
David Kerley	*The Discovery Channel*
Debra Cercelli	*Boeing*
Diane Rausch	*NASA HQ*
Dillon Laviale	*SpaceX*
Dominick Oppolo	*Citizen*
Donald Wood	*NASA*
Filena	*NASA*
Heather Scott	*NASA*
Itchin Duviat	*European Space Agency*
Jeff Foust	*Space News*
Joe Mancina	*GAO*
Joey Roulette	*Reuters*
Josh Finch	*NASA*
Kathryn Hambleton	*NASA*
Ken Darsars	*NASA*
Kenneth Change	*The NY Times*
Kiana Mitchell	*Boeing*
Kinsey Flanders	*Lockheed Martin*
Lakiesha Hawkins	*NASA*
Laura Forczyk	*Astralytical*
Linda Karanian	*Karanian Aerospace Consulting*
Lisa Hackley	*NASA HQ*
Lora Bleacher	*NASA*
Marcia Smith	*SpacePolicyOnline.com*
Melanie Osei	*OSMA RMO Manager*
Micah Maidenberg	*The Wall Street Journal*
Pamela Whitney	*Science Space & Technology Committee*
Rachel Kraft	*NASA*
Rebecca Regan	*Boeing*
Steve Creech	*NASA*
Susan Sawyer	*NASA Commercial Crew Program*

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

Theodore Kronmiller	*Law*
Tim Eallus	
Will Robinson-Smith	*Spectrum News 13*
Zudayyah Taylor-Dunn	*NASA HQ Space Operations Mission Directorate*

Appendix A

Teleconference Attendees[2]

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