

NASA AEROSPACE SAFETY ADVISORY PANEL

National Aeronautics and Space Administration

Washington, DC 20546

Lieutenant General Susan J. Helms, *Chair*

November 21, 2024

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

Dear Senator Nelson:

The Aerospace Safety Advisory Panel (ASAP) held its 2024 Fourth Quarterly Meeting in-person at NASA's Kennedy Space Center, October 28-31, 2024. 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 dark ink, appearing to read "Susan Helms", written in a cursive style.

Susan J. Helms, Lt Gen (Ret), USAF

Chair

Enclosure

AEROSPACE SAFETY ADVISORY PANEL

Public Meeting
October 31, 2024
Hybrid

2024 Fourth Quarterly Meeting Report

ASAP Panel Member Attendees

Lieutenant General Susan J. Helms, USAF (Ret), Chair
Mr. William Bray
Dr. Amy Donahue (*virtual*)
Mr. Paul S. Hill
Ms. Katharina McFarland
Mr. Charlie Precourt
Mr. Kent Rominger
Dr. Mark N. Sirangelo
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 1:00 p.m. eastern daylight-saving time (EDT) and welcomed everyone to the ASAP's Fourth Quarterly Meeting of 2024, held at the 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 comments prior to the scheduled meeting.

Lieutenant General (LTG) Susan J. Helms, United States Air Force (USAF)(Ret), chair, began by welcoming Ms. Katharina McFarland, Assistant Secretary of Defense for Acquisition and a career engineer, to the ASAP as its newest member. She then spoke on the rich and productive dialogue, beginning with an update from Janet Petro, Director of KSC. Ms. Petro detailed the scope and scale of changes at KSC and Cape Canaveral, emphasizing the complexities of managing operations amid an increasing launch tempo and supporting an expanding set of space tenants. The Panel observed the intricate challenges NASA faces across its enterprise, particularly at the Space Coast, which plays a critical role in processing and launch operations. These complexities were further highlighted by recent events, such as Hurricane Milton's passage just before the launch of the Europa Clipper. The Panel commended KSC for its dedication to mission and workplace safety and expressed appreciation for the team's continued commitment and hospitality.

Mr. William Bray discussed how the Exploration Systems Development Mission Directorate (ESDMD) Associate Administrator, Ms. Cathy Koerner, and Moon to Mars (M2M) Deputy Project Manager, Ms. Lakiesha Hawkins, along with their teams, met with Panel to discuss progress in the M2M and Artemis Program efforts. ASAP commended the continued advancement and maturation of the enterprise-level integrated risk management process, which has become a critical element of program execution. This process enables regular risk identification, discussion, and mitigation, and ASAP encourages NASA to extend this methodology to other manned system programs, such as the Commercial Crew Program (CCP) and low-Earth Orbit (LEO) initiatives.

For Artemis II, significant progress has been made, including resolving two of three critical path issues identified previously. The Orion crew module battery qualification issue has been corrected, and the Exploration Ground Systems (EGS) Emergency Egress System has been successfully installed and tested. Additionally, Mobile Launcher 1 refurbishment and corrective actions from the Artemis I launch have been completed. The remaining issue, the Artemis I Heat Shield char problem, has undergone review, and NASA is evaluating the next steps, with an update expected later this year.

Artemis III is advancing as planned, with ongoing hardware deliveries and testing. The Human Landing System (HLS) remains the critical path item, with recent successes such as Flight Test 5 demonstrating key capabilities. ASAP also noted the importance of developing and delivering Extravehicular Activity (EVA) suits. With numerous "firsts" for Artemis III, including a lunar South Pole landing and manned HLS operations, ASAP emphasized the importance of risk aggregation and continued maturation of risk management processes. Discussions with the M2M team highlighted the value of setting discrete mission objectives in a stepwise manner, drawing from Apollo-era practices.

For Artemis IV and beyond, progress continues across multiple hardware and mission activities. Highlights include advancements in Mobile Launcher 2, contracts awarded for the Lunar Terrain Vehicle (LTV), ongoing Blue Origin New Glenn HLS development, and Gateway's completion of its Critical Design Review (CDR) Informed Design Sync. Emerging supply chain challenges for Artemis IV and subsequent missions have been identified and are being addressed.

Overall, the parallel development and engineering efforts across Artemis II through Artemis V demonstrate impressive activity levels. ASAP emphasized the need for continued focus, engineering rigor, and attention to detail to overcome the complexities of the Moon to Mars mission set and ensure successful execution. The panel acknowledged the team's hard work and looks forward to ongoing collaboration.

Mr. Kent Rominger, on behalf of the Panel, commended NASA and the CCP for their diligent work addressing issues with Boeing's Starliner Crew Flight Test (CFT) and noted the inclusivity of the decision-making process, which reflected a healthy safety culture. Starliner successfully launched on June 5, 2024, aboard a United Launch Alliance (ULA) Atlas V rocket and autonomously docked with the International Space Station (ISS). Despite performance issues in the propulsion system, including small helium system leaks and reaction control thruster failures,

NASA and Boeing conducted extensive testing and analyses during the mission to evaluate system readiness. Key accomplishments included testing navigation and docking systems, evaluating crew controls, and assessing communication and life support systems. NASA's decision to return Starliner uncrewed, unanimously approved by leadership, prioritized safety and included a comprehensive review of risks. Post-flight efforts focus on anomaly resolution and preparing for future certification and missions.

SpaceX continued its record-setting pace of operations, successfully completing multiple missions, including Crew-8 and Crew-9, and maintaining Crew Dragon as a reliable platform for ISS operations. Notable achievements included Crew-8's 235-day mission and seamless integration of contingency plans following the Starliner decision. However, SpaceX faced challenges such as parachute deployment irregularities, booster landing issues, and second-stage anomalies, which required thorough investigations and corrective actions. Despite the impressive pace, ASAP emphasized the importance of maintaining attention to detail, particularly as hardware ages and operational demands increase. Both NASA and SpaceX must remain vigilant to uphold safety standards and ensure robust root cause analyses for anomalies while managing the high operational tempo and ongoing Starship development program.

Dr. Richard Williams discussed how ASAP met with Mr. David Francisco, Technical Fellow for Health, Medical & Performance Spaceflight Standards at NASA Headquarters, and Mr. David Baumann, Director of NASA's Human Research Program (HRP), to address questions from the panel's last annual report. The Office of the Chief Health and Medical Officer (OCHMO) and HRP are closely aligned in identifying, characterizing, and mitigating human health and performance risks for exploration-class missions. OCHMO oversees crew health, establishes human health and performance standards, and provides medical care during missions, while HRP informs these standards and mitigates risks through applied research.

Mr. Francisco and Mr. Baumann organized their responses around the framework of primary, secondary, and tertiary care. Under primary care, NASA health standards, crew selection criteria, and mission-specific medical evaluations have been updated to address risks beyond LEO, such as galactic cosmic radiation, EVA carbon dioxide requirements, and health autonomy. Evidence for these standards is published in freely available technical and medical briefs. Secondary care, involving countermeasures for health and performance risks, is managed through the Inflight Crew Health and Performance System and focuses on physiology, behavioral health, performance, and space radiation. These countermeasures are critical for long-duration missions and rely on continued LEO access for development and validation. Tertiary care highlights include the development of Interagency Implementation and Advanced Concepts Team (IMPACT), a probabilistic risk assessment tool supporting exploration mission planning by identifying medical risks and mapping interventions.

To address unknown risks, particularly for Mars missions, HRP has outlined goals for advancing biological understanding and operational readiness in lunar and deep-space environments through a phased approach. This includes technology and operational demonstrations in cis-lunar space and on the lunar surface, with a gradual transition to Mars missions.

ASAP values these discussions, which enhance understanding of health and medical risks for lunar and Mars missions and their impact on mission safety. The panel looks forward to further updates as NASA's research and standards evolve.

LTG Helms addressed how the Panel had not met with the ISS and *NASA 2040* team at this time but was looking forward to updates. LTG Helms then handed the meeting over to Mr. Paul Hill to discuss the ISS transition plan.

Mr. Hill reviewed how NASA, in August, released a draft ISS transition plan and has since reviewed over 1,800 public and stakeholder comments. These included suggestions for clearer articulation of the reasons behind LEO destination choices, aligning with recommendations made by the ASAP in its previous annual report. NASA is revising the draft objectives and priorities for transitioning to a post-ISS environment, with Agency leadership expected to approve them by year-end for public release. ASAP views these objectives and their rationale as essential precursors to defining specific plans and resource commitments.

NASA's evolving focus for the transition shifts from ensuring a continuous human presence in LEO to maintaining a continuous capability, whether occupied or not. The current goal is to have a Commercial LEO Destination (CLD) operational approximately one year before the ISS deorbit, facilitating final crew activities, station closeout, and altitude decay before deorbit. NASA anticipates budget challenges in supporting both the ISS and CLD simultaneously.

The Agency is adopting an insight/oversight model for post-ISS operations, emphasizing its role in fostering the LEO economy rather than directly operating a follow-on platform. However, ASAP highlighted concerns about the potential loss of critical skills within NASA, such as risk assessment and management, without direct operational involvement. Additionally, managing partnerships with commercial LEO providers, especially when involving international partners and crew, could present legal and protocol challenges in integrating risks affecting NASA and its collaborators. The panel urges deliberate consideration of these complexities as NASA advances its transition strategy.

Mr. Mark Sirangelo discussed how the Panel had a productive fact-finding session with the CLD Program (CLDP) office, led by Ms. Angela Hart. CLDP is managing NASA's transition from the ISS next-generation LEO developed in partnership with industry. The program is preparing for a Phase 2 acquisition, with a mission concept review already completed with input from an Independent Review Team (IRT). An Agency Acquisition Strategy Meeting is scheduled for December 2024, with procurement expected in FY25. This work is being conducted jointly with the Space Operations Mission Directorate (SOMD) to align with NASA's overall LEO microgravity strategy and goals.

NASA has incorporated public feedback into the program's development and plans to release updated goals and objectives in December 2024 to guide participating industry organizations. Starting in October 2024, the management of Private Astronaut Missions (PAMs) will transition from CLDP to the ISS Program, with CLDP continuing to provide support.

CLDP has hosted several Technical Interchange Meetings (TIMs) to share insights and updates with industry, including sessions on safety requirements, updated program requirements, and a commercial space food TIM that attracted over 90 participants. Significant progress has been made by industry partners, including Blue Origin, Starlab, Axiom, Sierra Space, Vast, SpaceX, Northrop Grumman, Special Aerospace Services, and Think Orbital. While technical, financial, and logistical challenges remain, ASAP is encouraged by the strong industry interest and collaboration with NASA in advancing LEO destination development.

As 2024 concludes, LTG Helms noted that it is evident that NASA has navigated a challenging yet impactful year, demonstrating resilience and professionalism in addressing complex issues. The Panel commends NASA for exemplifying a healthy safety culture, particularly during the Starliner mission. Despite unprecedented challenges and uncertainty, NASA's team engaged in a transparent decision-making process that incorporated diverse perspectives, thorough data reviews, and risk assessments to achieve appropriate risk-managed outcomes.

Looking ahead to 2025, ASAP will focus on key issues with significant implications for risk and safety. These include the impact of budget constraints on NASA's ability to manage large, complex programs like the ISS, the planning and risk mitigation for early Artemis reference missions, and the integration of safety standards across multiple programs and contracts. The Panel also aims to study aggregate risk quantification and risk management approaches for fixed-price and service contracts. Additionally, ASAP will review lessons learned from the Starliner CFT mission and follow up on insights from NASA's annual safety culture survey. While 2024 has been a dynamic year, 2025 promises to be equally pivotal as the Panel continues its mission to provide informed guidance to NASA leadership and Congress.

Ms. Hamilton opened the meeting for public comment. No comments were received.

LTG Helms adjourned the ASAP Fourth Quarterly meeting of 2024 at 2:17 p.m. EDT.

Appendix A

Teleconference Attendees¹

Adrianne Lewis	<i>Accountability Office</i>
Benjy Neumann	<i>NASA</i>
Beverly Perry	<i>NASA</i>
Crystal Jones	<i>NASA</i>
Darrell Beckman	<i>Boeing</i>
Debra Facelli	<i>Boeing</i>
Donald Wood	<i>NASA</i>
Eric Maier	<i>NASA</i>
Heather Sniph	<i>JPL</i>
Jamie Krauk	<i>NASA</i>
Jeff Foust	<i>Space News</i>
Jessica Londa	<i>NASA</i>
Jimi Russell	<i>NASA</i>
Jose Ramos	<i>Accountability Office</i>
Josh Finch	<i>NASA</i>
Joy Kim	<i>GA</i>
Kenneth Chang	<i>New York Times</i>
Kristin Van Wichen	<i>US GAO</i>
Lane Talak	<i>NASA</i>
Laura Polk	<i>NASA HQ</i>
Lynn Cline	<i>NASA</i>
Maddie Simgupta	<i>NASA</i>
Marcia Smith	<i>Spacepolicyonline.com</i>
Mark Carreau	<i>Aviation Week Space Tech</i>
Mazri	<i>Axiom Space</i>
Michelle Green	<i>NASA</i>
Miles Doran	<i>CBS News</i>
Nick Ball	<i>Aero Space Corporation</i>
Rebecca Regan	<i>Boeing</i>
RC Gallardo	<i>NASA JSC</i>
Roshan Fernandez	<i>Wall Street Journal</i>
Russ Deloach	<i>NASA</i>
Shizam Patel	<i>Axiom Space</i>
Stephen Clark	<i>ARS Technica</i>
Susan Sawyer	<i>NASA</i>
Sylvie Espinasse	<i>European Space Agency</i>
Tamy Lentz	<i>Nasaspaceflight.com</i>

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