

**THE NASA ADVISORY COUNCIL**

October 1-2, 2024

MEETING REPORT

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***October 1, 2024***

**Welcome & Introductions**

The National Aeronautics and Space Administration (NASA) Advisory Council (NAC) convened its public session at Marshall Space Flight Center (MSFC), welcoming members both in person and online. Ms. Jamie Krauk, Executive Director, called the meeting to order, welcoming NASA leadership and public participants. This session marked the second NAC meeting of 2024 and underscored the NAC’s role as a federal advisory body under the Federal Advisory Committee Act (FACA), ensuring adherence to federal regulations, transparency, and public access.

Meeting minutes will be documented and available on NASA's NAC website. Each NAC member is selected by the NASA Administrator for their subject matter expertise, serving as special government employees bound by federal ethics guidelines. All presentations and comments during the session are recorded as part of the official public record. NASA Administrator, Senator Bill Nelson and NASA Deputy Administrator, Colonel (USAF)(Ret) Pamela Melroy, were introduced.

*Remarks by NASA Leadership*

Senator Nelson and Col. Pam Melroy addressed the NAC public session, sharing key updates and progress across the agency's programs. Reflecting on NASA’s past achievements and ongoing initiatives, they highlighted both the accomplishments and challenges as the agency approaches its fourth year under the current administration.

Key updates included the Mars Perseverance rover’s ongoing sample collection and a streamlined, more cost-effective approach to returning those samples. The James Webb Space Telescope’s remarkable data continues to redefine the understanding of the universe, and plans are underway to extend its life through future refueling efforts. The Artemis program’s milestones were celebrated, including the Artemis 1 mission’s successful lunar orbit and ongoing preparations for Artemis 2, aimed at a September 2025 launch. International partnerships through the Artemis Accords have expanded, reinforcing peaceful exploration and cooperation, with over 40 countries now signed on.

Col Melroy emphasized NASA’s commitment to continuity of purpose in multi-generational missions, maintaining focus across administrations to achieve NASA’s goals. This strategic stability is ensured by developing cross-agency strategies, including the Moon-to-Mars (M2M) objectives, climate and space sustainability frameworks, and the Low-Earth Orbit (LEO) Microgravity Strategy. The *NASA 2040* strategy, which focuses on long-term organizational sustainability, continues to prioritize investments in workforce, infrastructure, and technology. Col. Melroy underscored the need to align NASA’s strategies with a robust agency master plan and interlocking objectives for a unified vision.

General Lester L. Lyles, United States Air Force (USAF)(Ret), chair, commended NASA's continuous recognition as a top federal workplace, noting the agency’s strategic attention to employee feedback as a reflection of its success. Senator Nelson also reiterated NASA’s

commitment to remaining a leader in science, space exploration, and international cooperation, as well as ensuring national and global benefits from its discoveries.

NASA leadership concluded by affirming the importance of NAC's guidance in shaping NASA's trajectory.

#### *Highlights from Marshall Space Flight Center*

Ms. Rae Ann Meyer, Deputy Director of MSFC provided an update on Marshall's ongoing work and future plans. Ms. Meyer welcomed NAC members, NASA leadership, and public participants, emphasizing Marshall's role in NASA's mission to explore, innovate, and inspire. Marshall, known for its legacy since the 1960s, is dedicated to pioneering new capabilities for space exploration and scientific discovery, with plans to celebrate its 65th anniversary next year.

Marshall's initiatives were categorized into four domains: Launch, Land, Live, and Learn. In the *Launch* portfolio, Ms. Meyer highlighted the Center's responsibility for the Space Launch System (SLS), a key element in NASA's Artemis missions to the Moon, Mars, and beyond. The SLS was essential to Artemis I's success, and preparation is underway for the upcoming Artemis missions. Marshall also supports the Commercial Crew Program (CCP), ensuring safe systems engineering and launch operations for missions to the International Space Station (ISS).

In the *Land* domain, Marshall is responsible for the Human Landing System (HLS), collaborating with industry partners like SpaceX and Blue Origin. The goal is to support sustainable lunar exploration with systems that enable cargo and astronaut missions.

In the *Live* domain, Marshall continues to manage science operations on the ISS, including life support systems and scientific experiments essential for deep space exploration. For instance, their work in regenerative water recovery systems aims to achieve 98% water recovery, crucial for future long-term human missions.

In the *Learn* domain, Marshall's work in X-ray astronomy, exemplified by the Chandra X-ray Observatory and recent Earth sciences missions, contributes to advanced research and practical applications, including climate data for real-world decision-making.

Addressing workforce challenges, Mr. Sedwick shared that 30% of Marshall's workforce was new since COVID, presenting both opportunities and challenges. Marshall's focus is on providing meaningful work and development opportunities, leveraging local partnerships, and engaging with diverse educational institutions to attract talent. Internship programs, including a collaboration with the Department of Education and community colleges, have seen success in bringing diverse talent to NASA.

The session concluded with a Q&A, followed by appreciation for Marshall's contributions and support, and a scheduled break before discussions on NAC's priority focus areas.

#### **NAC Priority Focus Areas**

General Lyles discussed that Senator Nelson, upon becoming the Administrator, identified five specific priority areas for focused review: international collaboration; commercial and industry partnerships; diversity, equity, inclusion, and accessibility (DEIA); climate change; and program

management and acquisition. He appointed specific individuals to examine these areas and provide recommendations for NASA.

### *International Collaboration*

For international collaboration, Senator Nelson selected the Honorable Jane Harman and Honorable Kay Bailey Hutchison due to their expertise and involvement in international activities. Senator Kay Bailey Hutchinson and Congresswoman Jane Harman emphasized the value of NASA Administrator Bill Nelson's international visits, especially to countries in the Global South, which have significantly bolstered NASA's international image and inspired widespread interest in the Artemis Accords. They highlighted NASA's role as a valuable instrument of U.S. soft power, with countries worldwide keen to engage in space initiatives and Science, Technology, Engineering, and Mathematics (STEM) education as ways to join the space-faring community. They noted that while many nations wish to contribute technically, STEM education has been a particularly effective entry point, allowing even resource-limited countries to participate in collaborative missions.

Congresswoman Harman underscored the importance of aligning space-related efforts across government agencies, suggesting stronger ties with the State Department to strengthen space diplomacy and coordination. In support, the Honorable Charlie Bolden, former NASA Administrator, emphasized expanding partnerships with African nations and other regions in the Southern Hemisphere, where interest in space activities is growing.

The council also considered the role of NASA's STEM programs in advancing global collaboration. Mr. Dan Dumbacher, chair of the STEM Outreach Committee, and other NAC members discussed how NASA might engage international students and educators more actively, either directly or through partnerships with U.S. universities that maintain international campuses. Suggestions were made to leverage partnerships with private philanthropies and international organizations to support NASA's global outreach goals. Overall, NAC members reiterated that international collaboration and STEM engagement are essential to extending NASA's influence and fostering a truly global space exploration community.

### *Diversity, Equity, Inclusion and Accessibility*

Ms. Jacklyn Wynn addressed DEIA, focusing on current challenges, terminology shifts, and NASA's approach to broadening its outreach and workforce inclusivity. She opened the discussion, likening NASA to a "thriving ecosystem," similar to a coral reef, with its broad STEM programs creating diverse opportunities and cultivating the future STEM workforce. She highlighted how the terminology around DEIA is evolving across industry, government, and academia, with terms like "belonging," "community," and "togetherness" becoming more common, which helps neutralize potential negative perceptions and broadens participation.

Ms. Wynn also emphasized the impact of emerging Artificial Intelligence (AI) tools in hiring, noting that AI-driven job application processes, such as USA Jobs, raise questions about ensuring inclusive practices, as AI algorithms require testing to avoid bias. Additionally, she noted that NASA is increasingly exploring skill-based hiring, which can help diversify its talent pool by focusing on skills rather than strictly requiring four-year degrees.

Regarding outreach, Ms. Wynn commended recent collaborative efforts between NASA, the DoD, the Food and Drug Administration (FDA), and other agencies to expand the reach of minority engineering programs. She stressed the importance of maintaining partnerships with institutions like Historically Black Colleges and Universities (HBCUs), particularly in states where DEIA programs face legislative challenges. For instance, Florida A&M University recently had to close its DEIA office due to state policies, presenting challenges for NASA's recruitment efforts in those areas.

The Council also discussed the need for guardrails in AI usage in hiring, in line with proposed legislation from Senator Ed Markey to ensure fair and unbiased hiring processes. Ms. Wynn noted that some universities are facing legal pressures on affirmative action and declining minority enrollment, impacting the diversity of the STEM pipeline. Finally, the council recognized NASA's unique position in supporting DEIA efforts within an evolving regulatory landscape, particularly as similar issues challenge other agencies and sectors.

The discussion closed with an acknowledgment of the need to prepare for potential challenges, considering that recent legal actions may influence DEIA practices nationwide, underscoring the importance of inclusivity-focused language and strategies for meeting NASA's future workforce goals.

#### *Climate Change*

Dr. Waleed Abdalati provided an overview of the current state of Earth science missions and the challenges facing climate change research and monitoring.

Dr. Abdalati highlighted both progress and challenges. On the positive side, several Earth-observing missions have exceeded their original lifespans, and NASA has approved continued operations for sixteen of these missions. Recent launches, such as the Polar Radiant Energy in the Far-Infrared Experiment (PREFIRE) and Plankton, Aerosol, Cloud, ocean Ecosystem (PACE) missions, add valuable data on Arctic radiation, phytoplankton, and aerosols. Additionally, six more Earth science missions are in development, and NASA's Earth Action Plan has improved data accessibility and promoted user-informed Earth science policies and decision-making. NASA's partnerships with international space agencies continue to strengthen, enhancing global collaboration on climate science.

However, Dr. Abdalati noted substantial challenges, particularly with the Earth System Observatory – the primary mission series of this decade for climate science – which is facing delays and budget overruns. The decadal priorities set by the National Academies for the current decade may not be fully realized until the next, representing a significant setback in gaining critical climate insights.

A significant gap is the lack of an organized structure for continuity of measurements for key climate variables. While operational agencies like NOAA handle specific observational functions, numerous Earth measurements critical for understanding long-term climate trends fall outside typical operational mandates, leaving critical data gaps. For example, observations related to ice sheets and sea level rise lack a consistent, designated agency for long-term management.

Budget constraints, rising costs due to inflation, extended mission operations, and increased mission scope further impact NASA's climate capabilities. The Landsat Next program has presented additional financial pressures, requiring NASA to absorb hundreds of millions of dollars in costs. The decadal survey's recommendations emphasize the need to prevent "mission creep" and control costs to avoid compromising other parts of NASA's Earth science program.

The discussion also highlighted an overarching issue: while NASA is recognized for its climate science efforts, there is a perception among the scientific community that climate research may not be prioritized as highly as other NASA initiatives. Dr. Abdalati suggested a need for clear communication about the prioritization of climate science within NASA's broader mission framework.

The NAC and Dr. Abdalati discussed continued inter-agency dialogue to address these challenges. It was suggested that NAC members collaborate with other bodies, such as the National Space Council and SMD, to improve inter-agency coordination and ensure sustained resources for critical Earth science measurements. This collaborative approach is expected to help clarify NASA's role in climate science and address the need for continuity in climate observations across various agencies.

#### *Program Management and Acquisition*

Mr. Charlie E. Williams, Jr., Ms. Krista Paquin, and Dr. M. Elisabeth Paté-Cornell focused on refining recommendations for NASA leadership. Their findings emerged from a comprehensive review of NASA's acquisition and management practices, informed by interviews, industry feedback, and best practices, particularly from the DoD. The review highlighted three core areas for improvement: workforce training, acquisition strategy, and risk management. In workforce training, NASA's Chief Program Management Office (PMO) was noted as a positive step, but the need for consistent training funding, especially in acquisition and program management skills, remains crucial. Recommendations included restoring training funds to pre-2019 levels, reviewing the distribution of Senior Executive Service (SES) billets across NASA centers, and establishing an industry-government exchange program to foster a deeper understanding of commercial practices among NASA staff.

For acquisition strategy, NASA's established Acquisition Strategy Council has made progress, yet inconsistencies in program manager engagement result in variable adherence to acquisition protocols. Key recommendations were to enhance accountability in acquisition strategy, apply specific criteria such as financial viability to contractor selection, and establish an Industry Council to promote regular dialogue on best practices and acquisition goals. Program performance and risk management findings highlighted improvements in NASA's approach, such as the establishment of a Chief Risk Officer and the recent Tiger Team report, yet challenges like budget instability and optimism bias persist. Recommendations included regular reviews between senior NASA and industry leaders to ensure alignment on program performance and an emphasis on implementing Tiger Team recommendations, particularly in defining civil servant roles within projects to maintain efficiency.

Council members stressed the broader strategic need for NASA to incorporate lessons from private industry to remain competitive, especially against international space initiatives like China's. Members suggested that the Industry Council could help NASA explore more agile,

efficient approaches to program management that balance risk with innovation. The committee also discussed the possibility of establishing a dedicated training fund model, as used in the DoD, to ensure sustained workforce investment.

The session concluded with an emphasis on embedding these recommendations into *NASA's 2040* vision, establishing the Industry Council as a structured feedback platform, and maintaining accountability to advance NASA's program management and acquisition leadership.

### **NAC Committee Updates**

Each NAC Committee provided summaries from their recent Committee meetings. Most of those Committee meetings featured briefings from, and discussions with, the relevant NASA technical Mission Directorate.

#### *NAC Science Committee Report*

General Lyles recognized incoming chair Dr. Amanda Hendrix. Dr. Noël Bakhtian, outgoing interim chair, and incoming chair, Dr. Amanda Hendrix provided updates and discussed key scientific developments. Dr. Hendrix, a senior scientist with expertise in planetary science, welcomed four new committee members. The meeting overviewed SMD highlights, including updates to personnel in the Biological and Physical Sciences Division (BPS) and Planetary Science Division (PSD), and changes to NASA's operating mission portfolio. Notably, the Volatiles Investigation Polar Exploration Rover (VIPER) lunar mission and Griffin 1 have been removed from the fleet, while the Artemis II and III missions have been added, indicating a dynamic mission portfolio.

Key science highlights included upcoming missions across several divisions: NASA-Indian Space Research Organization (ISRO) Synthetic Aperture Radar (NISAR) in Earth Science, the Sikh Quantum experiment in BPS, Spectro-Photometer for the History of the Universe, Epoch of Reionization and Ices Explorer (SPHEREx) in Astrophysics, Escape and Plasma Acceleration and Dynamics Explorers (ESCAPADE) in Heliophysics, and the Europa Clipper in Planetary Science. The launch of Europa Clipper, scheduled for October 10th, 2024, will investigate Europa's icy crust and ocean interactions, with significant implications for our understanding of habitable environments in the solar system. The committee acknowledged the importance of continued Research and Analysis (R&A) funding to enable scientific advancements across missions.

The upcoming Science Committee meeting will address topics including climate change strategy, space weather hazard mitigation, and updates on SMD's open science initiatives, with time allocated for public input. Future discussions will emphasize the importance of the Deep Space Network (DSN), a critical infrastructure for NASA's communications, with findings and recommendations planned for public review and voting. The Committee stressed the need to escalate DSN issues within NASA leadership, highlighting the necessity of resources and strategic alignment to ensure DSN's long-term viability.

### *NAC Technology, Innovation, and Engineering Committee Report*

The Technology, Innovation, and Engineering (TIE) Committee, chaired by Mr. Michael Johnson, recently convened to discuss key advancements and findings across NASA's Space Technology Mission Directorate (STMD). The committee, which is undergoing restructuring to include more industry representation, reviewed a series of technology updates and center-specific innovations. This included in-depth project updates from the Glenn Research Center, where the committee explored current work on nuclear propulsion, cryogenic fluid management (CFM), and several lunar and Mars mission-supporting technologies. Among these, nuclear thermal propulsion (NTP) was highlighted for its alignment with National Academies' recommendations, emphasizing balanced funding between fission and fusion technologies. The committee praised the increased funding but noted that progress in nuclear electric propulsion (NEP) must continue to address critical technology gaps.

Cryogenic fluid management was identified as crucial to upcoming lunar and Mars missions, particularly within the Artemis program. The committee supported STMD's plans for an integrated cryogenic demonstration mission, noting, however, that budget constraints currently limit the advancement of critical technologies like in-space fluid transfer and long-term cryogenic storage. The need for extensive ground and flight demos to test these systems was strongly emphasized, with the committee urging NASA to prioritize the necessary funding given CFM's critical-path role in human space exploration. Additionally, the TIE Committee supported STMD's shortfalls process, a systematic method to identify technology gaps and prioritize future investments based on inputs from NASA, industry, and academia. "Survive and operate through the lunar night" emerged as the highest-priority shortfall, reflecting broad consensus on the critical need for resilient lunar surface technology.

Recognizing the evolving public-private dynamics within space exploration, the committee explored NASA's data-sharing approach, expressing some concerns about access restrictions, which could impact program timelines and technology integration for human missions. STMD's commitment to collaborations with industry and academia was acknowledged, but the committee recommended formalizing data-sharing agreements to align with critical-path requirements and reduce integration delays. Members also suggested exploring the Department of Energy's Adoption Readiness Level (ARL) model alongside the Technical Readiness Level (TRL) scale to enhance the transition of technology into industry sectors.

Key technological initiatives were also reviewed, including lunar and in-situ resource utilization technologies, the Intuitive Machines 1 mission demonstrating subsurface drilling at the Moon's South Pole, and the Nokia LTE project supporting lunar surface communication. The committee recommended continued progress on CFM demos and encouraged more robust budget prioritization to ensure timely achievement of Artemis objectives. In closing, the TIE Committee emphasized the need to reassess budget allocations and data-sharing policies, underscoring the importance of successful industry partnerships and technological readiness to achieve NASA's Moon-to-Mars mission architecture.

### *NAC Aeronautics Committee Report*

Dr. Hassan Shahidi reviewed NASA's advancements and strategies in aeronautics, focusing on two primary areas: sustainable aviation and the integration of advanced air mobility (AAM) into the national airspace. Dr. Shahidi engaged with NASA researchers and key industry partners, discussing how new technologies could support the U.S. Aviation Climate Action Plan. A major component of this meeting was an update on NASA's Sustainable Flight National Partnership, which aims to reduce emissions and improve fuel efficiency through technologies now being integrated into real-world operations. Dr. Shahidi also highlighted the importance of developing a comprehensive "digital twin" for the national airspace to simulate and analyze risk factors and trade-offs in AAM integration. Additionally, the Aeronautics committee emphasized the need for low-cost Automatic Dependent Surveillance-Broadcast (ADS-B) systems to increase visibility and safety for aircraft not currently equipped. Another key area of discussion was the need for strong multi-stakeholder partnerships and collaborations with the Federal Aviation Administration (FAA), industry, and other agencies to ensure the efficient, safe integration of new aerial technologies, such as UAS and future flying taxis. The committee's findings reflect the critical role of advanced simulation tools, standards development, and cross-agency coordination in achieving NASA's aeronautics and sustainability goals for mid-century.

### **Public Comment Period & Adjournment**

Gen. Lyles opened the meeting for public comments. During the public comment period, attendees were invited to provide feedback using the meeting's Q&A function. Initial comments highlighted the Mars Sample Return (MSR) mission's importance for advancing knowledge before human exploration on Mars, noting the need for adequate budget and engineering innovation due to the mission's complexity, especially concerning the Mars Ascent Vehicle (MAV). One commenter suggested that repurposing parts of the Artemis program could support MSR if costs continue to rise. Another comment expressed concerns over the ambitious scope of the current lunar architecture and its alignment with the safety and budget constraints, questioning if modifications could help meet the lunar landing schedule safely. Gen. Lyles clarified that while there are questions about the balance between the lunar architecture's goals and budget, NAC members do not have explicit issues with the selected approach.

Gen. Lyles then formally adjourned the meeting with appreciation for the Council and Committee's dedication and expressing gratitude for public engagement.

***October 2, 2024***

**Welcome & Announcements**

Gen. Lyles opened the meeting. NAC Committee members reflected on the previous day's productive sessions and Marshall Space Flight Center tours. They also appreciated the opportunity to discuss critical issues directly with NASA Administrator Nelson and Col. Melroy. The agenda for the day included updates from additional committee chairs and a comprehensive session on NASA's advancements in AI. The agenda also scheduled a review session to revisit previous NAC recommendations and findings, followed by closing remarks. Before beginning the day's discussions, NAC members, both on-site and virtual, introduced themselves, sharing their backgrounds and roles on the Council.

**Highlights of NASA's Summer of AI**

A discussion on NASA's "Summer of AI" was led by Chief Artificial Intelligence Officer David Salvagnini, Jill Marlowe, Digital Transformation executive, and Kelly Elliott, Chief Human Capital Officer. Salvagnini presented the Agency's advancements and future strategies in AI. He outlined NASA's ongoing efforts to incorporate AI across various domains, emphasizing AI's historic role in specialized fields, such as autonomous systems on Mars rovers and climate modeling. Mr. Salvagnini noted the shift toward widespread generative AI applications, which NASA has embraced for process optimization, science, and workforce training. The expansion of AI access at NASA aims to improve operational efficiency, with generative AI supporting areas like document summarization, technical searches, and coding updates.

An essential part of NASA's AI strategy is workforce education. Chief Human Capital Officer Kelly Elliott detailed NASA's AI skilling initiatives, emphasizing self-directed learning formats, simulations, and live sessions that attracted 4,000 participants. A consultative portal staffed by NASA's AI specialists also supports broader workforce engagement. Mr. Salvagnini highlighted NASA's AI registry, a system for continuous tracking of AI use cases to promote transparency and compliance with federal requirements. Additionally, NASA plans targeted initiatives in critical areas, including facilities maintenance, procurement, and grant adjudication, to refine operational AI applications and ensure responsible, inclusive, and efficient implementation.

Mr. Salvagnini underscored NASA's commitment to ethical and secure AI practices, referencing federal regulations and the agency's proactive measures to manage data integrity and mitigate bias. The upcoming release of NASA's AI strategy and continued partnerships, including collaborations with federal agencies and external entities, aim to align NASA's AI journey with broader government objectives, ensuring that AI development advances safely and sustainably across the agency.

**NAC Committee Updates/Reports**

*NAC STEM Engagement Committee Report*

Mr. Daniel Dumbacher, chair of the STEM Engagement Committee, shared an in-depth report on NASA's Office of STEM Engagement's efforts and recent advancements. Under the direction of Mr. Mike Kincaid, the Office of STEM Engagement has worked diligently to align its initiatives

with NASA's strategic priorities, emphasizing measurable impact across key areas, particularly underserved and underrepresented communities. Mr. Kincaid's team has focused on strengthening partnerships across NASA's directorates, such as collaborations with the Science and Aeronautics Mission Directorates, as well as with external partners like the Department of Education and Microsoft, to enhance public engagement through educational resources and events like the recent solar eclipse outreach.

The Committee also highlighted ongoing efforts to make NASA's content accessible through the STEM Gateway, reaching over 200,000 users and nearly 8,000 institutions, and providing support to educators. This gateway is integral to the mission of expanding STEM awareness and engagement across diverse audiences. Furthermore, metrics for audience demographics, program reach, and engagement are meticulously tracked to ensure alignment with NASA's broader objectives.

The Committee's findings underscore the value of STEM Engagement's contributions to NASA's public image and its strategic focus. Suggestions for improvement include sustaining and enhancing collaboration across NASA's divisions and with external partners to extend reach and impact. Additionally, they suggested that NASA leverage external sources, such as industry organizations and nonprofits, to bolster its efforts in underserved communities.

#### *NAC Human Exploration and Operations Committee Report*

Ms. Lynn Cline discussed current developments, strategic planning, and challenges within NASA's exploration and space operations programs. She highlighted several key areas, starting with updates on the Artemis program, noting that while there is significant progress, the team is still working on the Orion heat shield's root cause and flight rationale.

She reviewed NASA's evolving M2M architecture, which included identifying gaps for improved cargo capabilities and lunar surface mobility, vital for sustained lunar operations. White papers were prepared to underscore these needs, suggesting that NASA explore options for diverse and redundant providers, including potential industry and international partners.

For the Space Operations Mission Directorate (SOMD), the focus was on the upcoming transition from the ISS to commercial LEO destinations by 2030. Given the ISS's end date, NASA aims to avoid a gap in human presence in LEO, necessitating a robust strategy that includes supporting commercial destinations and ensuring sufficient crew and cargo capabilities. She commended NASA for initiating a LEO Microgravity Strategy to support the science and industrial community, aligning with NASA's vision for a post-ISS era.

Ms. Cline raised concerns over astronaut radiation risk, which requires further risk-reduction research, especially as NASA plans for extended deep-space missions. The meeting also covered progress on Boeing's Starliner, where although the flight test met key objectives, further certification work remains.

NASA's approach to space communications was also noted. She praised the recent strategic shift towards leveraging commercial providers and interoperable systems to meet growing

communication and navigation needs across NASA's missions. They suggested ongoing coordination with other federal agencies to align plans for NASA's TDRS system's retirement.

The Committee proposed two key findings: emphasis on continuity in cargo and crew services to ensure uninterrupted scientific operations and partnerships post-ISS and support for ongoing collaboration with commercial and international partners, advising that NASA encourage commercial players to independently forge international partnerships.

Lastly, Ms. Cline expressed concerns over the impact of multiple audits on NASA's programs. She suggested exploring ways to streamline the audit process across various oversight bodies to reduce the administrative burden on program staff without compromising governance standards.

### **NAC Roundtable Discussion & Deliberations**

The Council discussed strategies for managing audit schedules, prioritizing international partnerships, and recommendations for transitioning the ISS and space communications networks. Council members raised concerns about the frequency and overlapping nature of audits on exploration and space operations, suggesting that NASA explore phased audit schedules to minimize administrative burden. Members also emphasized the importance of maintaining international partnerships, particularly encouraging commercial sector involvement in collaboration with global partners.

The Council highlighted the importance of maintaining continuous crew and cargo services during the ISS-to-commercial LEO transition to avoid gaps in scientific research. This goal requires robust planning and budgeting, especially given ISS's projected retirement in 2030. Members also commended NASA's approach to updating space communication networks, supporting the shift from legacy systems to commercially integrated networks, and suggested continued NAC oversight as new communication systems are developed.

Further, the Council acknowledged upcoming budget pressures on NASA's human exploration and science programs, stressing the importance of consistent funding for these initiatives to ensure NASA's strategic goals are met. They added a specific finding on the need to support the DSN, connecting it to the overall strategy for long-term space communication needs.

The NAC Science Committee recommended actions for SMD, the NAC priority focus area findings and recommendations to the NASA Administrator, and the NAC findings and recommendations to the NASA Administrator are attached.

### **Adjournment**

The NAC concluded its session by reviewing key follow-up actions and confirming next steps. All recommendations and findings presented at this meeting, along with those deferred from prior sessions, will be formally compiled and categorized for transmittal. This final transmittal document will be reviewed by NAC members before submission to the NASA Administrator.

In terms of future scheduling, NAC plans to establish a regular meeting cadence with sessions tentatively set for October, February, and June, coordinating specific dates with the Administrator's office to align with NASA's priorities and schedule. Additionally, in line with

NAC's commitment to transparency, minutes and public agendas from this meeting will be posted on the NAC website in the coming weeks for public access.

Gen. Lyles extended sincere appreciation to all members, the public attendees, and the host center for their contributions and engagement. Special thanks were offered to departing members for their dedicated service. The meeting adjourned with a note of gratitude from all involved, underscoring the collaborative spirit and dedication of the committee.

## **Appendix A**

### **NAC Science Committee Recommended Actions for the Science Mission Directorate**

#### **From Science Committee Meeting in 2023**

##### **Findings:**

- The FY 2024 NASA Budget request provides good support for SMD mission and goals.
- The SMD Summer Meeting presentation summarized the launch of new mission and the continuation of outstanding mission science.
- Decadal Survey recommendations focus on the most impactful basic research questions. The subsequent development to missions can take up a decade and require significant budgetary commitments and planning. SME has consistently sought to honor Decadal Survey recommendations (e.g., Mars Sample return)

##### **Recommendations:**

SMD should provide input to future NAC SC meetings that includes:

- SMD philosophy on balance of innovation and risk (e.g., SMD CLPS missions)
- The status of preserving the integrity of planetary bodies under international exploration and possible future commercial development.
- Update on the SMD climate change research study (e.g., what missions/programs are in place and under planning)
- Planning based on the release of the BPS Decadal Survey
- Update on detection and warning capabilities for Space Weather events.

#### **From Inclusion, Diversity, Equity, and Accessibility (IDEA) Presentation at Science Committee Meeting in 2023**

##### **Findings:**

- The SMD ‘Lowering the Boundaries (LTB) to Science’ initiative includes a powerful approach to IDEA as part of the Europa Clipper mission with its Clipper Next Generation Initiative. The goal of the initiative is to develop a diverse team of scientists prepared to lead the mission beginning in 2035 when Clipper is approaching Europa. The long-term program includes student cohorts, mentors, pathways, and cultural considerations to support students through the stages of their education and early professional life.
- NASA’s Earth Information Center (EIC) provides compelling content and core services to provide stakeholders with access to data and software that supports broad participation in research and applications. Partnerships with other US and international agencies broaden the potential impact of the EIC

##### **Recommendations:**

- SMD should expand the impact of the Lower the Boundaries (LTB) initiatives by developing an overarching set of principles, top-level strategies, lessons learned, best practices, incorporating previously successfully tested efforts.
- SMD should develop a centralized repository and identified POCs to capture consolidated LTB best practices and share with others.
- SMD should continue to build on the capabilities of the EIC, including full development of the Science Discovery Engine.

*From Transform to Open Science Program (TOPS) at Science Committee Meeting in 2023*

**Findings:**

- NASA/SMD is continuing to develop capabilities to support the providers and users of open-source science, and effectively using standard methods of community engagement to assess user needs
- SMD is commended for including TOPS principles in funding criteria.
- The TOPS Open Science 101 course now in beta-testing is a useful first step to incentivize and support the use of good data science principles.
- Specific inclusion of participants from non-R1 institutions in Open Science 101 is an important link of TOPS with Inclusivity, Diversity, Equity, and Accessibility (IDEA) efforts.
- The use of ‘badges’ for completion of the stages of the Open Science 101 course provides a useful incentive structure for organizations building Open Science capabilities.
- There remain community concerns about archive/storage requirements for software.

**Recommendations:**

- SMD should provide clear documentation and examples for the use of standard packages such as ORCID, Zenodo and Github for open-source data and software.
- The Open Science 101 course design should expand or add a module on the benefits and coordination of TOPS/IDEA practices.
- The prioritization criteria for migrating information to the cloud and quickly making information broadly available should include environmental social justice.

*From Science Committee Meeting in 2024*

**Findings:**

- NAC Science Committee can provide better feedback to SMD if provided with direct input concerning the budget and the factors considered in making decisions about where and how cuts should be applied.
- Greater clarity on these topics would help SMD better communicate with its stakeholders.
- Each division in SMD will support science under the Artemis program.

**Recommendations:**

- SMD should present budgetary information in the main presentation to the SC, including comparisons with recent previous budgets, requested budget and notional outyears budgets.
- SMD should improve communication with the SC and stakeholder committee by addressing the factors considered in implementing the budget including:
  - Clarify what tradeoffs were made, and how the consequences were assessed in line with SMD strategy, and risks/mitigations.
  - Clarify the procedures to be used in pending decisions, such as the change from mini-Senior Review to operational paradigm review for Chandra and HST.
  - Clarify how scientific goals will remain a pillar of SMD participation in the Artemis Program
  - Develop guidelines for addressing budgetary issues that create conflict with Decadal Survey priorities, such as cancellation of the Geospace Dynamics Constellation (GDC) mission, which is a flagship mission in the existing Heliophysics Decadal Survey.

*From Division Advisory Committee (DAC) Reports – Spring 2023*

**Findings:**

- Current SMD efforts include generation of a collection of IDEA resources, but still need better connection with the science communities; toward this aim, the PAC has suggested the creation of a community facing SMD point of contact for IDEA efforts to facilitate communications, resource sharing, and new program development:
- See also Finding 8 from June 2022 PAC Findings – “An existing model that may inform efforts to address this is the Planetary Data Ecosystem (PDE), where a paid, non-civil servant Chief Scientist has a mission to engage the community, is supported by an internal NASA group, and provides institutional support for a central information repository.

**Recommendation:**

- While respecting the diversity of the SMD Divisions in their approaches to inclusivity, SMD should identify, standardize and disseminate core best practices that all can use to prevent/minimize duplication of effort.

*From Division Advisory Committee (DAC) Reports – Summer 2023*

**Findings:**

- Presentations summarized the launch of new missions and continuation of outstanding mission science.
- Neither Earth Science nor the Heliophysics Advisory Committee have met for the last year.

**Recommendation:**

- SMD should provide input to future NAC SC meetings on the purpose and philosophy of the SMD advisory committee structure, execution of committee meetings and potential standardization across the divisions.

*From Division Advisory Committee (DAC) Reports – Spring 2024*

**Findings:**

- The DACS provide input to NASA from subject matter experts who are deeply engaged with NASA's mission.
- There is a variability across the SMD divisions in how NAC SC DAC's operate. In particular, divisions differ in how much information about decision making and budget is provided to the DAC's and how often they meet.
- The DACS may present their Findings and Recommendations (F&Rs) directly to SMD. If the DACS have F&Rs that require attention of the NAC, these are discussed/vetted at the Science Committee so these F&Rs can be elevated to the NAC.

**Recommendation:**

- SMD should establish guidelines for knowledge sharing and transparency between SMD divisions and their DACs, including participant of the DACs in proposing agenda topics, and regular meeting frequency.

## **Appendix B**

### **NAC Priority Focus Area Findings and Recommendations to the NASA Administrator**

#### **Program Management and Acquisition**

##### **Findings:**

##### Training, Development and Organizing for Success

- NASA has made tremendous progress with elevation of the Chief Acquisition Officer role to the Deputy Administrator and the establishment of the Office of Procurement in 2022.
- Recent positive progress includes establishing a Program Management (PM) Community of Practice through creation of the PM Network based on NASA's 70-20-10 learning framework, reinstatement of the annual PM Symposium, and sustained and strengthened Program Project Management Board (PPMB) engagement.
- NASA funding for workforce training and development has eroded since 2019, and there continues to be a need for a single integrated workforce development strategy across the PM community with adequate funding for formal education needs.
- There are inconsistencies in incentives and grade structures for PMs across the agency that often vary by center/program without full regard for the complexities and breadth of impact.
- Across the program management and acquisitions workforce there is inadequate understanding of commercial business practice and incentive structures

##### Acquisition Strategy

- NASA utilizes a disciplined Acquisition Strategy Council two-step governing process that includes early-stage strategy formulation and formal, documented decisions. However, some program managers have not demonstrated full commitment to the process. The recent creation of required presentation templates and the addition of a requirement for formal acquisition plans for high dollar acquisitions is to be commended as a means to facilitate improved commitment to the process.
- Pressure to use FP contracts without considered analysis for first time, low TRL, extensive development programs is unrealistic, high risk and not indicated based on federal acquisition practice and policy. Further, there can be a cultural bias for cost-plus contracts to retain insight and control thus limiting open dialog on innovative contracting practices.
- There is an opportunity for more consistent communications with Industry on NASA's acquisitions, strategies, processes and requirements. There is generally a lack of NASA workforce awareness, understanding and corporate knowledge of the legal, financial and competitive implications of NASA decisions on contract types and requirements.

##### Program Performance and Risk Management

- Top leadership support from the CAO is driving increased accountability and tools for improved mission performance as demonstrated through the establishment of the OPMO and the Risk Management Tiger Team.
- Application of lessons learned, and proven program control techniques have shown improvements in large mission performance:
  - Earlier Independent Review Boards to scrub missions before setting the baseline; Joint Confidence Level (JCL) for projects over \$1B; Implementation of EVM for in-house projects; Cost caps and definitive launch dates to remove subjectivity; Risk Informed Decision Making (RIDM).
  - Recurring characteristics of programs that don't perform to the baseline include:
  - Funding instability, phasing and variability.
  - Requirements creep and fluctuation often influenced by external drivers.
  - "Optimism bias": Overly ambitious cost, schedule assumptions and technology readiness dependencies.
  - Insufficient and untimely vertical and horizontal communications with leadership and line management both inside NASA and with industry partners.
  - Excessive civil service oversight, reporting requirements and insufficient coordination on center roles.

## **Recommendations:**

### Training, Development and Organizing for Success

- Examine internal agency funding models to restore the agency workforce training funds to levels prior to 2019 that protect this critical investment from external scrutiny and attack.
- Initiate an agency wide review of GS/SES allocations for program managers and ensure pay and grade structures reflect the complexity and risk of programs.
- Establish a DoD like Industry/Government Exchange Program to broaden understanding of commercial business practice and incentive structures.

### Acquisition Strategy

- Within the "Change Leadership" Executive Core Competency (ECQ), hold senior leaders accountable for timely and comprehensive commitment to the acquisition strategy process requirements and measurement of outcomes.
- Leverage feedback we heard from industry regarding best practices for the use of Fixed Price contracts that are a win for NASA and the space industrial base:
- Incorporate appropriate selection criteria that include financial viability, technical workforce availability, and past performance.
- Fund new developments via Cost Plus for the trials and testing phase (through to CDR) then use Fixed Price for development.
- Consistently reduce the risk of Fixed Price commercial development contracts with dual awards.

- Create a NASA/Industry Council chaired by the CAO to share plans and exchange ideas to inform and communicate NASA’s acquisition

#### Program Performance and Risk Management

- Formalize a requirement for Quarterly meetings of senior leaders between NASA and industry executives to focus on program performance and risk.
- Improve rigor in the early formulation phase including Independent Assessment at the MCR phase, identification of technical, cost, schedule risks and interdependencies to inform acquisition strategies.
- Clearly define and document the civil service role in programs/projects:
- For Commercial Contracts, ensure stability of requirements throughout the design and development process and commit to an upfront understanding and agreement that industry owns the technical baseline.
- For all programs/projects, PM’s obtain center agreement on reporting requirements and a commitment on how much engineering and programmatic oversight is needed based on the structure of the acquisition and center roles and responsibilities.
- Communication - Leverage the recommendations and actions taken in response to the Psyche IRB to ensure vertical and horizontal, open, credible and responsive communications for proper insight at the leadership and line management level of programs and projects.
- Embrace and implement the recommendations of the Risk Management Tiger team that includes establishment of the Chief Risk Officer (complete) and actions to ensure early identification of risk, communication, risk education and consistent risk management, implementation and tracking.

#### Diversity, Equity, Inclusion and Accessibility

##### **Findings:**

- Universities with teams implementing NASA DEIA/IDEA programs may face legal issues in states that have enacted legislation banning or limiting DEI programs.
- Implementation of Open-Source Data and Software requirements has raised concerns about possible negative impact on career development for scientists who play a primary role in producing these resources.
- The Small Business Innovation Research and Small Business Technology Transfer (SBIR/STTR) programs are Congressionally mandated with several important purposes, one of which is to “foster and encourage participation in innovation and entrepreneurship by women and socially or economically disadvantaged persons.” The SBIR/STTR program has done a commendable job working toward its goal to enhance equitable access and diverse representation and has made great strides in introducing new researchers to the community and preparing Minority Serving Institutions (MSIs) or other traditionally-underrepresented groups for larger funding opportunities within the program.

- Placing additional focus on workforce retention would be a beneficial step in achieving NASA's vision for its organizational culture.

**Recommendations:**

- NASA should develop clarification on how proposal requirements for DEI, OS and OSS will be fairly matched to budgetary resources available.
- NASA should provide guidance to universities and project teams in states with policies limiting DEI activities on how effective DEI activities can be legally supported.

## Appendix C

### **NAC Findings and Recommendations to the NASA Administrator**

#### Deep Space Network

##### **Findings:**

- The Deep Space Network (DSN)/SCAN is a pressing concern, particularly in the context of new budgetary constraints.
- The Deep Space Network (DSN) is heavily subscribed and does not appear ready to support the increasing demand and data rates of modern missions, including JWST, deep space missions, the surge needs of the Artemis missions, planned launch of Roman as well as the CLPS and M2M programs, and ride-along small missions without curtailing service to other missions or risking potentially dangerous outages.
- The DSN infrastructure suffers from deferred maintenance, and it needs significant modernization and increases in capacity to avoid putting NASA's legacy, present, and future missions at risk. Since November 2022, there have been three ~24-hour + full site outages, including one during the Artemis 1 mission.
- This deficit is an existential threat not only to present and future missions but also to human exploration, future commercial development, and national security.

##### **Recommendations:**

Recommend that NASA:

- Address the shortfall in NASA Deep Space Network (DSN) by:
  - Detailing and emphasizing the requirements for addressing deferred maintenance, expansion and sustainment of DSN, including a sustainable, systems-level DSN management model;
  - Completing plans for, and funding the expansion of, the capability of the DSN to maintain sufficient deep space communications capability for missions planned for the next decade.
  - Evaluate options to improve the efficiency of the present DSN, such as the GSFC/JPL and other labs/ activities on Delay/Disruption Tolerant Networks.
  - Inform and consult the science community about the available communications capabilities.
  - Evaluate the availability of interagency capabilities and potential commercial capabilities, including pros and cons; inform and consult the National Space Council on relevant issues.
  - Champion addressing the possibility of the DSN becoming part of a public-private, multi-stakeholder, sustainable, collaborative Solar System Internet as part of the Future DSN study.

#### Technology Infusion into the Moon to Mars Program

##### **Finding:**

- The TI&E and HEO Committees jointly believe the Agency and stakeholders should continue Fission Surface Power (FSP) funding and development, as well as other key technologies, to support lunar exploration and a sustainable commercial lunar economy.

**Recommendations:**

- Clearly identify infusion path for technologies currently in development by STMD into the Moon and Mars Program architecture.
- Identify Lunar Surface capabilities, in particular, In-Situ Resource Utilization (ISRU) capabilities within the lunar segments of the architecture.
- Conduct an architecture concept review focused on long term lunar presence and sustainability.
- Provide plans to demonstrate critical path technologies, including cryo-fluid management, to meet the human landing schedule given the current Artemis architecture.
  - The discussion should include needed subsystem developments, integrated flight demonstrations, and on-orbit demonstrations.

Human Exploration and Operations Committee for ESDMD

**Findings:**

- The Committee acknowledges and applauds the effort taken in the development of the agency-wide approach to the Moon-to-Mars Architecture.
- As written, the Moon-to-Mars Architecture Definition Document clearly embraces its purpose to translate the broad objectives into functions and use cases that can be allocated to executable programs and projects.
- The Committee embraces the Moon to Mars effort as a best practice that will serve the program well as it allocates available funds into prioritized programs and projects and recommends the Architecture Definition Document serve as a consistent guidepost for development of “Shall Statements” for follow-on contracted activity with industry partners.

**Recommendation:**

- Conduct a Lunar Lander Services schedule and risk assessment in order to ensure that these commercial developments, which are pacing items, are incorporated into the Agency planning effectively given the overall program budget and schedule constraints.

STEM Engagement

**Findings:**

- The Committee applauds the Office of STEM Engagement for its clear leadership in identifying, tracking and communicating key STEM engagement metrics with strong relationship to the OSTEM strategic priorities and plan. The Committee also recognizes that further coordination will increase the STEM engagement impact.

- Office of STEM Engagement is doing a great service of providing relevant, tangible content for educators and students. The Committee recognizes that the students are more easily finding the content via the internet. Therefore, the Committee recognizes the need for more targeted support to be provided to educators to assure the content has increased impact.
- Office of STEM Engagement is performing ground-breaking work with partner organizations and opening new opportunities for increased engagement across multiple audiences. The Committee recognizes the need for focused discussion, promotion and implementation of methods to better engage students, educators, and families in the under-served, economically disadvantaged, and under-represented communities. Focused attention to audience needs is key to this effort and further engaging the educational community.
- Appropriate funding is necessary to continue OSTEM's important work, including MSIs and partnerships, at least at the FY 24 President's Budget Request Level

**Recommendations:**

- NASA should develop ways to engage underrepresented communities attending educational institutions, in addition to Minority Serving Institutions (MSI), at the undergraduate and graduate levels.
- NASA should grow the important cross-Directorate STEM efforts via leveraging the NASA STEM Gateway, and close coordination among the Office of Communication and others. There is clear success with some Directorates (e.g., ARMD) and increased coordination among OSTEM, Office of Communications and the Mission Directorates will result in increased impact.
- NASA should catalyze additional efforts by the mission directorates to more-directly support the Minority University Research and Education Project (MUREP) more directly, such as co-funding the institutions in addition to the OSTEM funding. The MSIs are research sites making meaningful contributions to NASA's science and engineering knowledge and practice.

## **Appendix D**

### **NAC Council Members**

General Lester L. Lyles, USAF (Ret), Chair

Dr. Waleed Abdalati

The Honorable Charles F. Bolden Jr.

Dr. John-Paul Clarke

Mr. Daniel L. Dumbacher

The Honorable Eric Fanning

Ms. Lynn Cline

The Honorable Jane Harman

The Honorable Kay Bailey Hutchinson

Mr. Michael Johns

Dr. John Daniel Olivas

Ms. Krista Paquin

Dr. M. Elisabeth Paté-Cornell

Mr. Charlie E. Williams, Jr.

Ms. Jacklyn Mitchell Wynn

Dr. Margaret G. Kivelson, Ex Officio

Dr. Ilan Kroo, Ex Officio

### **Staff and Support Personnel**

Ms. Jamie Krauk, Executive Director

Ms. Marcia Guignard, NAC Staff

Ms. Dara Touma, NAC Staff

Ms. Amy Reis, Tom & Jerry, Inc

Ms. Ashley Mae, Tom & Jerry, Inc, Technical Writer

## **Appendix E**

### **Meeting Attendees**

Amanda Hendrix, NAC  
Amy Reis, Tom & Jerry, Inc  
Ashley Mae, Tom & Jerry, Inc  
Carol Hamilton, NASA  
Charlie E. Williams, Jr., NAC  
Daniel L. Dumbacher, NAC  
Dara Touma, NASA  
Denise Smithers, Executive Staff  
Eric Fanning, NAC  
General Lester L. Lyles, USAF (Ret), NAC  
Hassan Shahidi, Flight Safety Foundation  
J. Craig McArthur, NASA  
Jamie Krauk, NASA  
Jane Harman, Member at Large  
Jim Worm, NASA  
Kay Bailey Hutchinson, NAC  
Krista Paquin, NAC  
Lisa Hackley, NASA  
Lynn Cline, NAC  
M. Elisabeth Paté-Cornell, NAC  
Marcia Guignard, NAC Staff  
Mike Johns, NAC  
Noël Bakhtian, Bezos Earth Fund  
Rae Ann Meyer, Deputy Director, MSFC  
Reagan Hunter, NASA  
Thomas Zimmerman, NASA  
Waleed Abdalati, NAC

## **Appendix F** **Presentations**

1. Artificial Intelligence Brief to the NASA Advisory Council, *D. Salvagnini*
2. Delivery on Diversity, Equity, Inclusion Accessibility Update, *J. Wynn*
3. Human Exploration and Operations Committee, *L. Cline*
4. NAC Aeronautics Committee Report, *H. Shahidi*
5. NAC Science Committee, *A. Hendrix, N. Bakhtian*
6. NAC STEM Engagement Committee Meeting, *D. Dumbacher*
7. Program Management and Acquisition Focus Area, *C. Williams, K. Paquin, E. Paté-Cornell*
8. Technology, Innovation, and Engineering Committee Report NASA Advisory Council Meeting, *M. Johns*

**Appendix G**  
**Agenda**

**NASA Advisory Council Meeting**  
**Hybrid**  
**October 1, 2024**

Tuesday, October 1

0100 PM	Call to Order, Announcements	Ms. Jamie Krauk
0105 PM	Remarks by NAC Chair	Gen. Lester Lyles
0110 PM	Remarks by NASA Leadership	Deputy Administrator Pam Melroy
0130 PM	Highlights from Marshall Space Flight Center	Ms. Rae Ann Meyer
0145 PM	Break	
0200 PM	International Collaboration	Hon. Kay Bailey Hutchinson, Hon. Jane Harman
	Diversity, Equity, Inclusion & Accessibility	Ms. Jacklyn Wynn
	Climate Change	Dr. Waleed Abdalati
	Program Management & Acquisition	Mr. Williams, Ms. Paquin, Dr. Paté-Cornell
0335 PM	Break	
0350 PM	Science Committee Report	Dr. Noël Bakhtian
	Technology, Innovation, & Engineering	Mr. Michael Johns
	Aeronautics Committee Report	Dr. Hassan Shahidi
0500 PM	Public Comment Period	
0530 PM	Adjourn	

## Agenda

### NASA Advisory Council Meeting Hybrid October 2, 2024

#### Wednesday, October 2

0900 AM	Call to Order, Announcements	Ms. Jamie Krauk
0915 AM	Remarks by NAC Chair	Gen. Lester Lyles
1000 AM	Highlights of NASA's Summer of AI	Mr. David Salvagnini
1100 AM	STEM Engagement Committee Report	Mr. Daniel Dumbacher
1145 PM	Human Exploration and Operations	Ms. Lynn Cline
1200 PM	Break	
1015 AM	NAC Roundtable Discussion and Deliberations	All
1230 PM	Summary and Wrap Up	NAC Members
0100 PM	Adjourn	