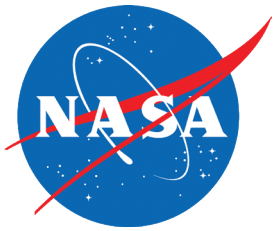
Office of Inspector General

2024 Report on NASA's

TOP MANAGEMENT and PERFORMANCE CHALLENGES

November 2024



Office of Inspector General

To report fraud, waste, abuse, or mismanagement, contact the NASA OIG Hotline at 800-424-9183 or 800-535-8134 (TDD) or visit https://oig.nasa.gov/hotline.html. You can also write to NASA Inspector General, P.O. Box 23089, L'Enfant Plaza Station, Washington, DC 20026. The identity of each writer and caller can be kept confidential, upon request, to the extent permitted by law.

To suggest ideas or request future audits, contact the Assistant Inspector General for Audits at https://oig.nasa.gov/aboutAll.html.

Cover photo: On December 11, 2023, NASA's Orion spacecraft for the Artemis I mission splashed down in the Pacific Ocean after a 25.5-day mission to the Moon.
Source: NASA.

TABLE OF CONTENTS

Message from the Deputy Inspector General 2

Improving the Management of Major Programs and Projects 3

Partnering with Commercial Industry 10

Enabling Mission Critical Capabilities and Support Services 15

Appendix A: Acronyms 21

Appendix B: Management's Comments 22

MESSAGE FROM THE

DEPUTY INSPECTOR GENERAL

As required by the Reports Consolidation Act of 2000, this annual report presents the Office of Inspector General's independent assessment of the top management and performance challenges facing NASA. For 2024, we consolidated our previously reported seven challenges into three broader challenges to provide a more streamlined report that minimizes overlap, improves clarity, and highlights the interrelated nature of the issues. This year's challenges include:

- Improving the Management of Major Programs and Projects
- Partnering with Commercial Industry
- Enabling Mission Critical Capabilities and Support Services

NASA stands at the forefront of aeronautics, science, and space exploration and is responsible for numerous scientific discoveries and technological innovations. Since its creation in 1958, NASA has made extraordinary achievements in human space flight and science and aeronautics research and continues to maintain world renowned facilities and personnel.

Despite these achievements, substantial cost growth, lengthy schedule delays, and significant technical issues continue to impact not only human space flight programs, like the Artemis campaign, but also other major science and exploratory programs, projects, and missions. At the same time, NASA is partnering with commercial industry to build, own, and operate space systems so the Agency can purchase services for its exploration, science, and research needs. While these arrangements could drive new ideas, bring down costs, and grow the space economy, they also present the Agency with challenges to ensuring the long-term economic viability, safety, and reliability of NASA programs. Lastly, key to accomplishing all of NASA's missions is ensuring it has the right personnel, up-to-date facilities, secure information technology, and efficient procurements, all of which have been long-standing challenges for the Agency.

In deciding whether to identify an issue as a "top challenge" we consider its significance in relation to NASA's overall mission; whether its underlying causes are systemic in nature; and its susceptibility to fraud, waste, and abuse. These three highlighted challenges are not the only significant issues that confront NASA, and identification of an issue as a top challenge does not denote significant deficiencies or lack of attention on the Agency's part. Rather, most of these issues are long-standing, difficult challenges central to NASA's core missions. Consequently, they require consistent, sustained attention from senior NASA leadership and ongoing engagement with Congress and other stakeholders.

The Office of Inspector General is committed to providing independent, objective, and comprehensive oversight to improve Agency outcomes. To that end, we plan to conduct audits and investigations in the coming year that focus on NASA's continuing efforts to address these and other challenges.

George A. Scott
Deputy Inspector General

IMPROVING THE MANAGEMENT OF MAJOR PROGRAMS AND PROJECTS

Elements of the Challenge

- Changing requirements, significant technical issues, increased costs, and schedule delays continue to impact the sustainability of major programs and projects.
- Cost increases and schedule delays often create cascading effects across NASA's portfolio of projects.
- Without complete, credible, timely, and transparent cost and schedule commitments for the Agency's major projects, it is difficult for NASA, Congress, and stakeholders to make informed decisions about the prioritization of efforts and the Agency's long-term funding needs.

Artemis I Space Launch System and Orion spacecraft atop the mobile launcher on Launch Pad 39B at NASA's Kennedy Space Center in Florida. Source: NASA.

Each year, NASA invests billions of dollars in major projects (projects with life-cycle costs of at least $250 million) to extend human presence beyond low Earth orbit (LEO), to understand and explore Earth and the solar system, and to conduct aeronautics research. In fiscal year (FY) 2024, NASA planned to invest more than $80 billion over the life cycle of major projects in support of the Agency's Artemis campaign, LEO missions in support of the International Space Station (ISS or Station), and science and aeronautics research missions such as Mars Sample Return (MSR) and the X-59 Low-Boom Flight Demonstrator. While each of these projects incorporate one-of-a-kind technological and scientific advances, they often cost more and take longer to develop than promised—the effects of which are felt across the Agency. Among the challenges NASA faces managing these projects are overly optimistic assumptions about cost, schedule, and the level of effort required to develop new technologies.

ARTEMIS CAMPAIGN

NASA's Artemis campaign is a multi-mission, multi-decade endeavor to return humans to the Moon and build a sustainable lunar presence as a foundation for human exploration of Mars. To achieve this ambitious and costly undertaking, the Agency is overseeing the development of several new systems. These include the Space Launch System (SLS) heavy-lift rocket, the Orion Multi-Purpose Crew Vehicle (Orion), upgraded ground systems to support the launch of increasingly powerful rockets, two Human Landing Systems (HLS) to transport astronauts from lunar orbit to the Moon's surface, the Gateway space station, next-generation spacesuits, and a lunar terrain vehicle (LTV).

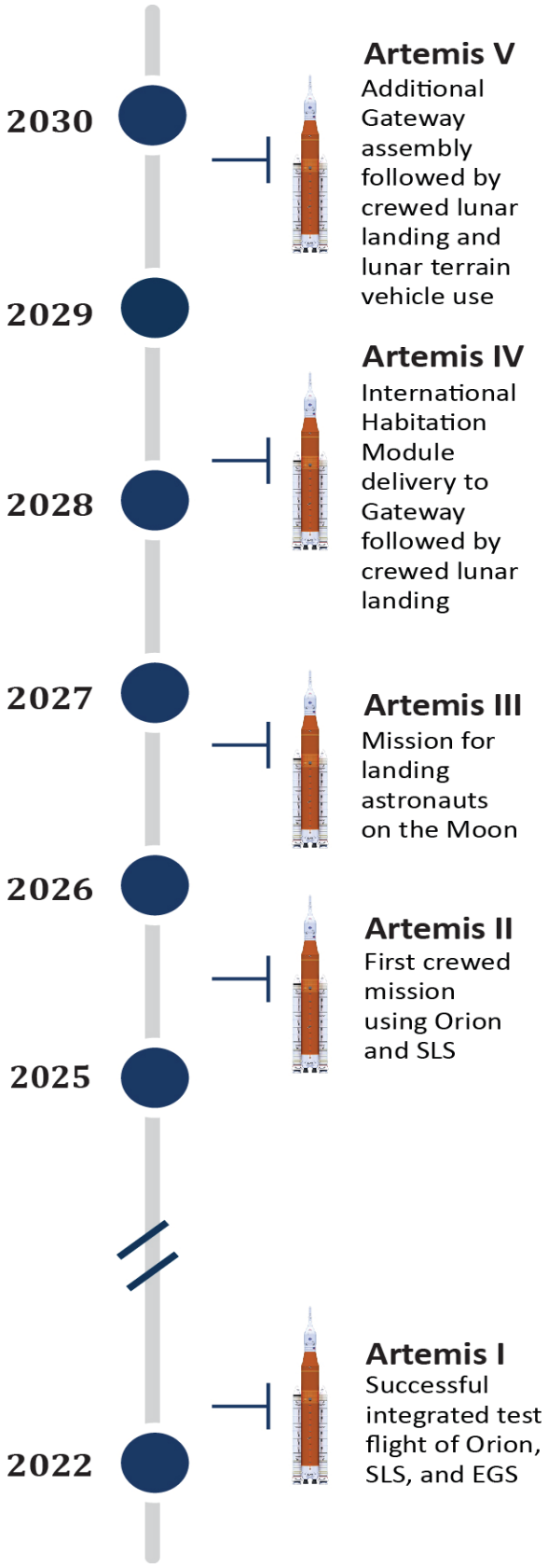
After more than a decade of preparation and several delays, in December 2022 NASA successfully completed Artemis I—an uncrewed test flight to lunar orbit. Artemis I was a significant achievement for NASA, providing important data and lessons learned from the testing of hardware, software, processes, and teams that will help prepare the Agency for future Artemis missions. Despite this achievement, NASA still faces multiple challenges to achieve its ambitious Artemis goals.

One foundational challenge facing the Artemis campaign is its enormous expense. Our past work has shown that NASA has had difficulty controlling costs of its key systems associated with Artemis, resulting in concerns about the overall sustainability of the program. In 2021, we projected total Artemis costs between 2012 and 2025 to be $93 billion, with the production costs through at least Artemis IV to be $4.1 billion per launch. Since then, NASA has requested additional funding for Artemis systems through FY 2029, with the Artemis V mission delayed until 2030. At the same time, the lack of a comprehensive cost estimate for the Artemis campaign means that Congress and other stakeholders lack the level of transparency and insight needed about the long-term cost, feasibility, and sustainability of the effort.

NASA must also continue to resolve technical challenges that could impact plans for upcoming Artemis missions. The most immediate challenge is the

The crew of NASA's Artemis II mission.
Source: NASA.

Figure 1: Artemis I through Artemis V Missions (as of October 2024)



Source: NASA OIG presentation of Agency information.

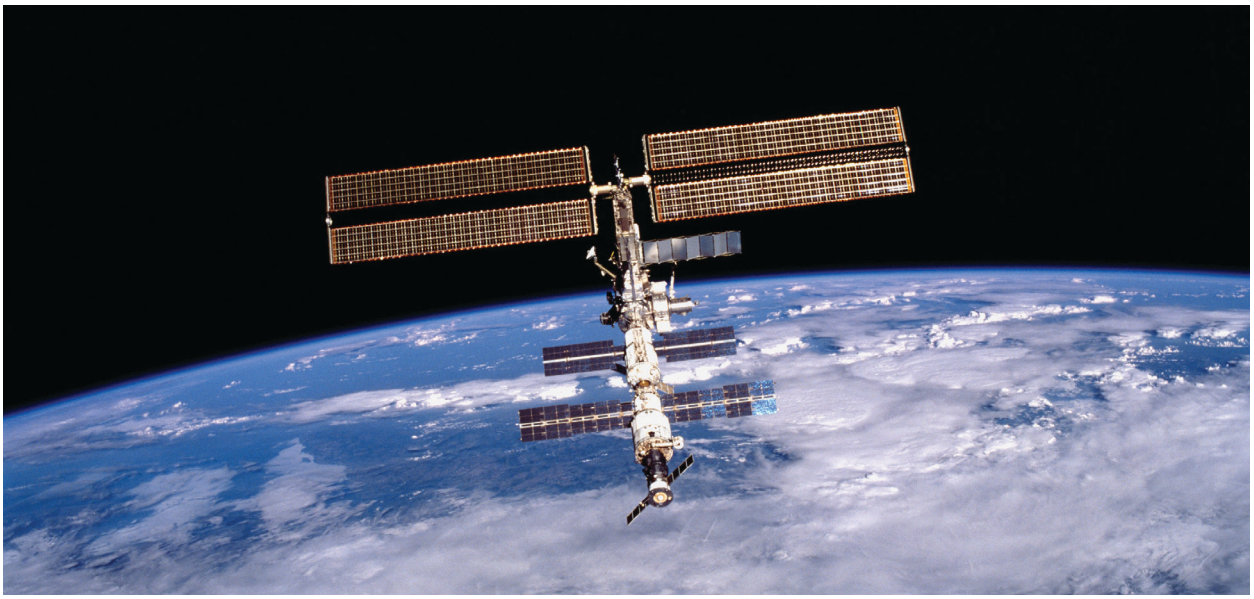
Artemis II mission, set for September 2025, which will return humans to the lunar orbit for the first time in more than 50 years. See Figure 1 for a timeline of Artemis missions. Like Artemis I, the crewed test flight will require SLS, Orion, and Mobile Launcher 1 (ML-1)—the platform and tower that supports SLS launches. Since Artemis I, NASA has worked diligently to analyze and address technical issues that emerged from the test flight, such as those with Orion's heat shield. While the heat shield successfully protected the Orion Crew Vehicle and its systems during the mission, upon inspection, engineers noted unexpected variations in the appearance of the material that helps protect the capsule from the heat of reentry. Specifically, portions of the char layer wore away differently than NASA engineers predicted, breaking off the spacecraft in fragments rather than melting away as designed. To its credit, NASA expressed a commitment to understanding the root cause of the heat shield char loss. Moreover, the Agency is taking action to address other issues that impact its launch readiness, including upgrades and modifications required to support the addition of crew and testing and integration of the SLS, Orion, and ML-1.

NASA also faces forthcoming challenges as it prepares for Artemis III—the mission intended to return humans to the surface of the Moon. NASA has delayed the mission to September 2026 in part to provide additional time to develop Space Exploration Technologies Corporation's (SpaceX) HLS Starship, which the company is developing along with the Super Heavy Booster for lunar landing services for Artemis III and IV. Prior to the crewed mission, SpaceX must conduct multiple flight tests, establish a "fuel depot" in LEO, and demonstrate on-orbit propellant transfer to refuel the Starship lander. To mitigate risk, SpaceX must also conduct an uncrewed demonstration mission to land on the lunar surface. To date, SpaceX has launched five test flights of Starship. While the first three ended prematurely, the fourth and fifth test flights completed their objectives.

Concurrently in development is Axiom Space's next-generation spacesuits. NASA has chosen to use a commercial services contract with Axiom Space for the Artemis III spacesuits, issuing a task order in September 2022 worth nearly $230 million. Axiom is required to test the suits in a spacelike environment prior to Artemis III. While several improvements are expected to the previous government design of the suits—such as Axiom-designed life support components and cooling systems—additional testing may be required to mature these systems. To create redundancy, in July 2023 the Agency issued a task order to Collins Aerospace—tasked with developing a new ISS spacesuit—to begin cross-developing an additional spacesuit for use on the lunar surface. However, in June 2024, Collins announced

it was stopping development of its spacesuits for both Artemis and the ISS. While this eliminates NASA's planned spacesuit redundancy, SpaceX is developing its own spacesuits, which were tested during a private astronaut mission in September 2024.

NASA's challenges for missions beyond Artemis III include development of upgraded SLS rockets and the second mobile launcher (ML-2), building the space station Gateway, bringing a second lunar lander option online, and debuting the LTV. ML-2 is a critical part of the infrastructure needed to launch the upgraded SLS Block 1B and Block 2 rockets. Originally awarded in June 2019 for $383 million with a delivery date to NASA in March 2023, we reported in August 2024 that NASA now estimates the contract to cost no more than $1.8 billion and delivery of the launcher to occur by September 2027. However, we projected that costs could reach $2.7 billion, and delivery could be delayed until Spring 2029, surpassing the planned September 2028 Artemis IV launch date. In addition, the upgraded SLS Block 1B currently under development, which will launch from the ML-2, continues to experience cost increases, schedule delays, and quality management deficiencies. The Agency continues to refine requirements for Gateway and is reviewing the schedule to better align with the Artemis IV mission. NASA's second HLS provider's system—Blue Origin's Blue Moon lander—must demonstrate its on-orbit propellant transfer and perform one uncrewed demonstration mission to the lunar surface prior to its expected use for Artemis V in 2030. In April 2024, NASA announced the selection of three companies to develop LTV capabilities.



International Space Station with a view of Earth.
Source: NASA.

INTERNATIONAL SPACE STATION

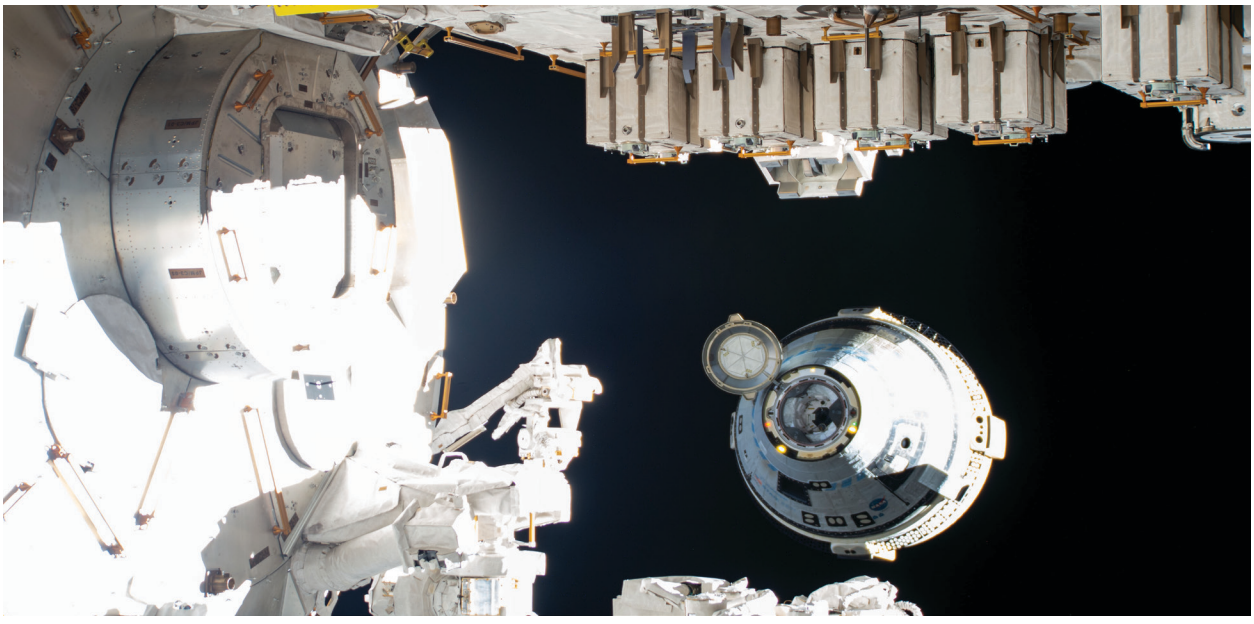
The ISS is the world's preeminent orbiting microgravity research and development laboratory. The Station serves as a springboard for NASA's commercialization initiatives in LEO as well as the Agency's long-term deep space exploration goals to the Moon and Mars. For nearly 25 years the ISS has provided researchers the unique ability to study the effects of long-term exposure to microgravity and other extreme conditions to enhance a variety of research efforts including human space exploration. Among other pursuits, continuing research in LEO is integral to NASA's Artemis lunar missions and future crewed missions to Mars, particularly the research to mitigate human health risks.

Despite the Station's accomplishments and NASA's on-going need for research and access to LEO, maintaining ISS operations, including providing crew and cargo transportation, has proven to be costly, consuming 16 percent of NASA's annual budget in 2023. As the Station ages, NASA will have to ensure the safety of astronauts aboard while sustaining continuous operations, including conducting science and research and maintaining the ISS. NASA expects to continue operations and maintenance of the Station through 2030. However, as the Agency delays the retirement of the ISS farther into the future, a variety of long-standing challenges will continue to intensify. These include maintaining and upgrading the Station, managing cargo and crew transportation constraints, and solidifying a transition and controlled deorbit plan.

NASA will face challenges maintaining and upgrading the Station to sustain operations through 2030. In September 2024, we reported that on-going cracks and air leaks in the Service Transfer Tunnel (a tunnel that connects the Russian Service Module to the rest of the Station) are a top safety risk. While NASA and Roscosmos (Russia's Space Agency) are collaborating to investigate and mitigate the cracks and leaks, in February 2024 NASA identified an increase in the leak rate and in April 2024 the leak rate reached its highest level to date. Threats from micrometeoroids and orbital debris (MMOD) are also a top risk to crew safety, the ISS structure, visiting vehicles, and sustained ISS operations. Recently, a probable MMOD strike on a docked Soyuz led to the termination of a planned spacewalk, a coolant leak on the Soyuz, and months of contingency operations planning for the safe return of the crew that were assigned to the ISS on that vehicle.

Sustaining ISS operations to 2030 will also be highly dependent on reliable transportation to and from the Station. In the near term, NASA faces challenges with both cargo and crew transportation from its providers due to delays in vehicle certification and availability. SpaceX's Dragon vehicle provided cargo and crew transportation to the ISS since 2012 and 2020, respectively. Additionally, Northrop Grumman Corporation's Cygnus vehicle provided cargo transportation since 2014. However, following Northrop Grumman's commercial resupply mission to the Station in August 2023, the supply of heritage Antares rocket engines used to launch the cargo vehicle was exhausted. Until the company's new launch rocket is ready (expected in 2025), Northrop Grumman is using SpaceX's Falcon 9 rocket for cargo resupply missions. In addition, Sierra Space Corporation's cargo Dream Chaser and Boeing's crewed Starliner vehicles are not yet certified for cargo and crew launches. Starliner's recent launch to the ISS in June 2024 suffered helium leaks and propulsion system failures that caused NASA to return the capsule to Earth uncrewed and delayed the two crewmembers planned return flight until February 2025 on a SpaceX Crew Dragon. The lack of redundancy and limited capabilities of both cargo and crew transportation increases the risk to NASA's ability to bring supplies, science, and crew to and from the Station. Should the single launch vehicle fail, NASA would rely on its international partners to transport cargo and crew to continue conducting science and research.

Looking ahead, NASA and its partners continue to develop a transition and deorbit plan to prevent an operations gap in LEO and ensure a safe and controlled deorbit of the ISS. In June 2024, NASA awarded an $843 million firm-fixed-price contract to SpaceX to provide the U.S. deorbit vehicle. However, several factors—namely budget availability, schedule risk, and Russia's uncertain commitment—will impact the ability and timing of deorbiting the Station. NASA's contract with SpaceX is for delivery of the vehicle to NASA and does not include the cost of launch and rendezvous with the Station. Moreover, the June 2024 contract award date leaves NASA and SpaceX only about five and a half years to design, develop, test, produce, and launch the vehicle to meet the planned 2031 deorbit target. Lastly, Russia is currently committed to ISS operations through 2028 but has not yet committed through 2030, which includes the deorbit plan and timeline. Without commitment from Russia to the current deorbit plan, NASA's ability to conduct a controlled deorbit is unclear.



Boeing's uncrewed Starliner spacecraft backing away from the International Space Station after undocking on September 6, 2024.
Source: NASA.

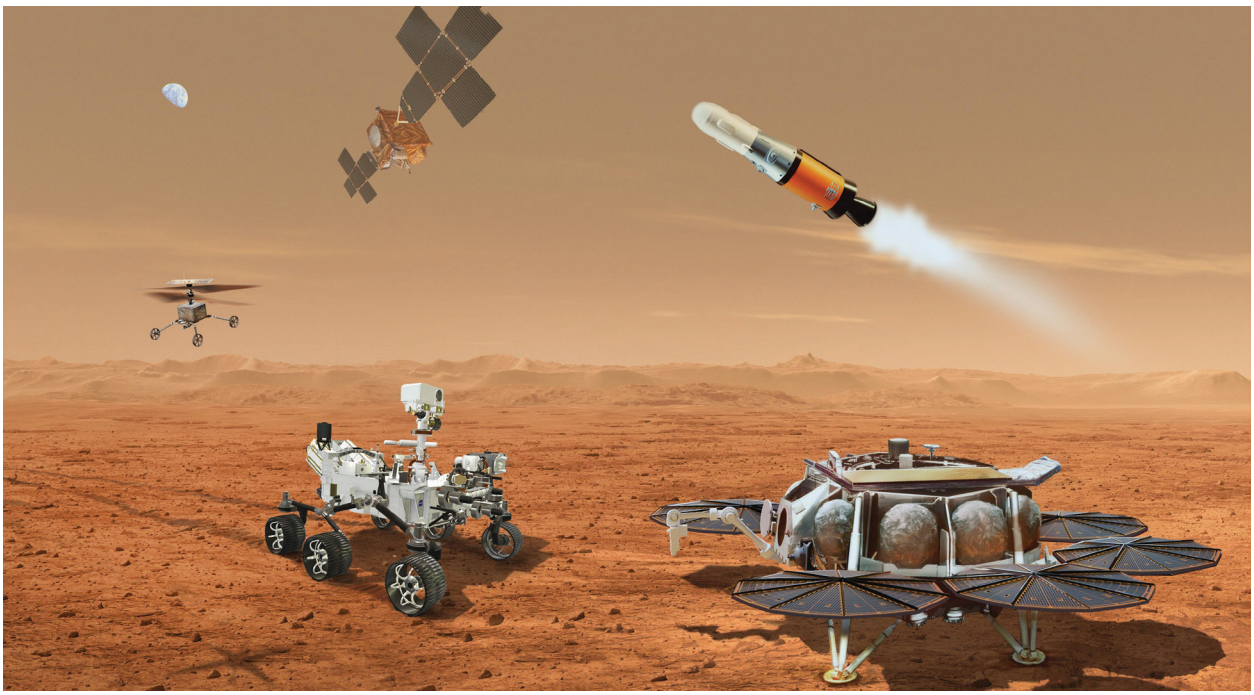
SCIENCE AND AERONAUTICS RESEARCH MISSIONS

With direction from Congress, the administration, and the larger science community, NASA's Science Mission Directorate (SMD) pursues missions that address a diverse set of scientific objectives. These missions have resulted in the collection of significant scientific information, including the James Webb Space Telescope (JWST) changing our understanding of the universe. The success of these missions provides new insight into our understanding of the development of life on our own planet as well as other bodies within our solar system and beyond and may also help further NASA's exploration goals. Likewise, efforts by NASA's Aeronautics Research Mission Directorate (ARMD) aim to increase the safety and sustainability of the aviation industry for the 21st century with research programs focused on high-speed commercial flight, advanced air mobility, ultra-efficient airliners, and future airspace and safety.

Effectively managing the development of major science and aeronautics projects has been a longstanding challenge for NASA, with cost and schedule overruns being of particular concern. Some of NASA's most impressive missions now in operation such as JWST experienced significant cost increases and schedule slippages beyond what was originally planned. Unfortunately, several current missions in development are experiencing the same fate.

In May 2020, we reported on ARMD's efforts to develop the X-59 Low-Boom Flight Demonstrator, which would aim to prove supersonic flight, could be accomplished without the typical loud sonic boom produced by all other aircraft at supersonic speeds. At that time, NASA estimated the project life-cycle cost at $583 million and planned the first flight for no later than January 2022. However, development has not gone as planned and, in December 2023, the Agency established a new life-cycle cost of $839 million and first flight no later than October 2024. The delay impacted the timetable for NASA to present its flight data to the Federal Aviation Administration and the International Civil Aviation Organization for the development of new standards that could enable environment-friendly, over-land supersonic civil transport aircraft.

The 2023 Planetary Science Decadal stated that "the highest scientific priority of NASA's robotic exploration efforts this decade should be completion of Mars Sample Return," and described a $5.3 billion budget profile for the Program. We reported in February 2024 that MSR had significant challenges establishing credible cost and schedule estimates. In 2020, NASA estimated that MSR would cost $3.6 billion and later projected that elements would launch as early as 2027. However, a NASA Independent Review Board concluded that the Agency could not accomplish MSR's mission



Conceptual rendering of the multiple components being developed as of February 2024 for the Mars Sample Return Program to transport samples of rock and soil being collected from the Martian surface by the Mars Perseverance rover to Earth.
Source: NASA.

within the established estimates. In April 2024, SMD revised the mission's design with a cost estimate in the range of $8 billion to $11 billion and launch estimates for individual elements between 2030 and 2035, which would return the samples to Earth in 2040. Agency leadership determined the cost and schedule untenable and asked the NASA community to work together to develop a revised plan that leverages innovation and proven technology. In addition, NASA solicited architecture proposals from industry that could return samples in the 2030s, at lower cost, risk, and mission complexity.

Cost increases and schedule delays often create cascading effects across the remainder of the portfolio. For example, NASA delayed the Nancy Grace Roman Space Telescope project and several other missions to make funding available for JWST. NASA proposed canceling the Roman Space Telescope several times between 2019 and 2021 to allow JWST to use the necessary resources. When the launch of the Psyche mission was delayed a year, resulting in an increase of approximately $132 million to its development costs, the Agency delayed the Venus Emissivity, Radio Science, InSAR, Topography, and Spectroscopy mission for at least 3 years. The Janus spacecraft, a secondary payload on the Psyche launch, was put in long-term storage while it awaits future funding and a new launch opportunity.

We recognize that each project is unique, as are the circumstances that lead to cost increases and schedule delays. However, through our work we have noted that NASA's culture of optimism often results in unrealistic assumptions about cost, schedule, and the level of effort required to develop new technologies for missions. In addition, we believe some of these assumptions can be traced in part to the expectations established in the National Academies of Sciences, Engineering, and Medicine's decadal surveys that guide SMD in its development of the portfolio. For example, we noted several issues with the $5.3 billion cost estimate for MSR provided by the 2023 Decadal Survey, not the least of which was an assumption of inflation at 2 percent—far below actual inflation rates in the range of 5 to almost 9 percent from mid-2021 to early 2023. NASA has demonstrated its ability to overcome technological and scientific obstacles to accomplish objectives. However, many of the Agency's planned missions are ambitious endeavors that need to be grounded in more realistic cost and schedule commitments.

We also continue to identify funding instability as an impediment to NASA's project management success. Unstable or uncertain funding, whether in terms of the total amount of funds dedicated to a project or the timing of when those funds are disbursed to the project, can result in inefficient management practices that contribute to poor cost, schedule, and performance outcomes. For example, inadequate funding in the early phases of a project's life cycle decreases management's ability to identify and address key risks at project inception. Moreover, lengthy continuing resolutions that lock the Agency's funding at the previous FY's level can be problematic. For example, in November 2023, NASA slowed work on the MSR mission due to funding uncertainty, which had the cascading effect of the Jet Propulsion Laboratory reducing its workforce.

To its credit, NASA has taken some action to address and attempt to mitigate these challenges. In early 2022, NASA established the Chief Program Management Officer in the Office of the Administrator to strengthen NASA's enterprise-wide oversight, management, and implementation of program management policies and best practices across Headquarters and Centers. These efforts include recurring independent assessment meetings to increase dialogue and foster knowledge transfer among participants as well as Community of Practice quarterly meetings to foster open dialogue and discuss suggestions for improvements in the Standing Review Board process. Additionally, SMD and ARMD have increased the use of Independent Review Boards to provide additional independent assessment of their major projects.

OIG Highlighted Work

- NASA's Management of Risks to Sustaining ISS Operations through 2030
- NASA's Management of the Space Launch System Block 1B Development
- NASA's Readiness for the Artemis II Crewed Mission to Lunar Orbit
- Audit of the Mars Sample Return Program
- NASA's Management of the Artemis Missions
- Management of the Low-Boom Flight Demonstrator Project

PARTNERING WITH COMMERCIAL INDUSTRY

Elements of the Challenge

- The transition to commercial space systems will require significant long-term financial investments by NASA and private companies as well as growing demand for non-NASA customers to ensure long-term economic viability.
- Commercial partners are competitors in an emerging industry, developing modern space transportation capabilities and associated operations that have never been available.
- The challenge to commercial partnerships comes in balancing the speed of development, flexibility, and adherence to timelines against the safety and reliability of new technology.

Conceptual rendering of SpaceX Starship human lander.
Source: SpaceX.

The National Space Council has made it a priority to foster a competitive and burgeoning U.S. commercial space sector to facilitate the growth of U.S. industry and support the creation of American jobs. NASA is partnering with commercial industry to build, own, and operate space systems so the Agency can purchase services for its exploration, science, and research needs. Industry can also use those same services for fully commercial activities in space. These public-private partnerships differ from the Agency's historic methods of doing business with commercial industry because vendors are expected to develop new technologies and deliver systems with limited NASA control or oversight of the contractors' designs, systems, processes, or infrastructure. NASA's work with the commercial space sector spans decades, initially led by a few early partnerships with private companies for satellite launches in the 1960s. By the early 2010s, NASA was using commercial resupply services to supply the ISS and later adopted commercial crew services to fill the void left by the retirement of the Space Shuttle. Since that time, NASA's commercial partners have launched more than 60 missions to resupply and provide crew to the ISS. Today, the Agency seeks to expand its partnerships with commercial industry even further to grow the LEO economy and venture further into space to develop a new lunar economy. While these partnerships can drive new ideas, bring down costs, and grow business opportunities, they also present NASA with challenges to establishing and nurturing partnerships that are innovative, cost effective, and sustainable while also delivering systems that are safe and meet the Agency's mission needs.

THE LOW EARTH ORBIT ECONOMY

The microgravity environment that LEO provides is essential for conducting crew training, fundamental and applied research, advanced systems development, and other activities that will facilitate human travel to deep space environments. NASA currently relies on the ISS for such research and is actively working to foster a robust market within LEO. For example, NASA's Commercial Resupply and Commercial Crew programs are enabling companies such as Boeing, Northrop Grumman, Sierra Space Corporation, and SpaceX to develop and operate the next generation of spacecraft and launch systems. In addition, the Agency has opened the ISS for business by expanding opportunities for in-space manufacturing, marketing, and promoting commercial products and services. NASA is also enabling private astronaut missions to the ISS through privately funded, fully commercial spaceflights that it hopes will spur tourism, outreach, commercial research, and marketing activities.

After the ISS is retired, NASA plans to sustain a human presence in LEO by becoming a customer of commercial LEO destinations (CLD). To this end, in 2021, NASA funded three Space Act Agreements with Blue Origin, Nanoracks, and Northrop Grumman for design of three free-flying commercial space stations to begin operations in the late 2020s for both government and private-sector customers. In June 2023, NASA initiated

Conceptual rendering of Starlab, a commercial space station being developed by Voyager Space.
Source: Voyager Space.

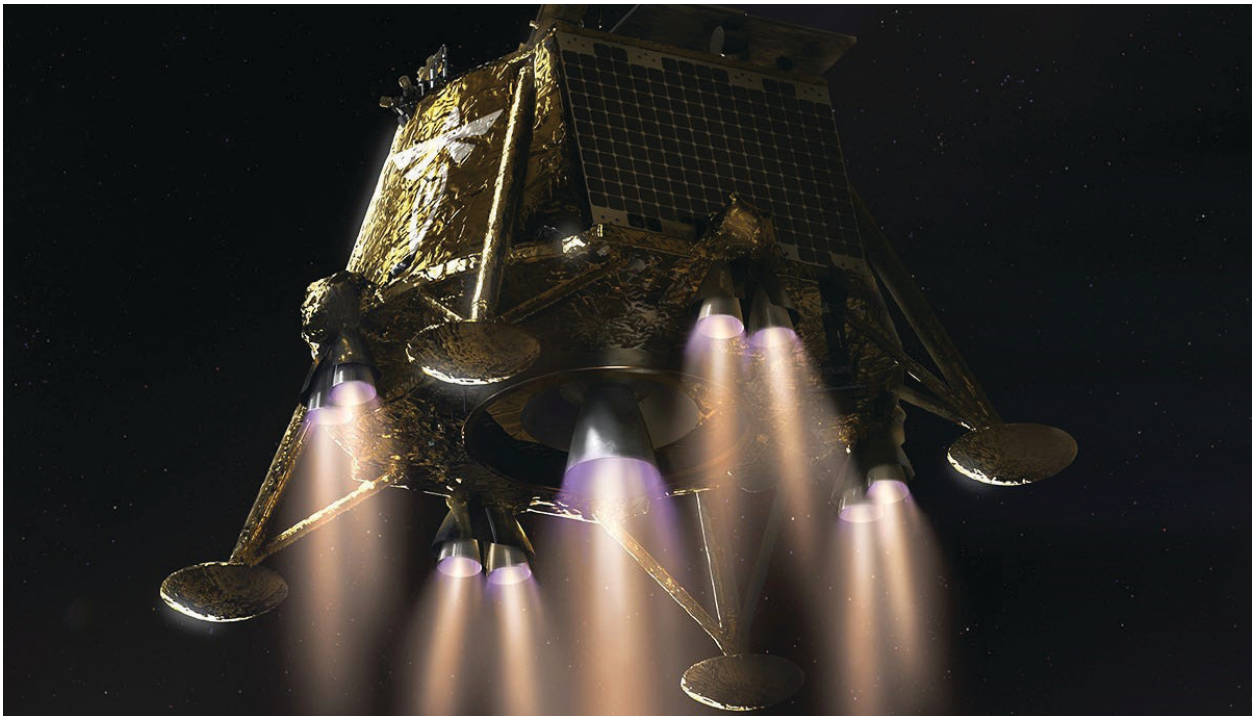
seven unfunded Space Act Agreements to provide support for CLDs by collaborating with U.S. industry for the development of new space capabilities such as destinations, in-space capabilities, and transportation.

While NASA's efforts to facilitate commercial LEO development show promise, our work has identified significant challenges that may hinder the Agency's plans. Though the volume of interest in private astronaut missions has exceeded NASA's expectations, significant demand for commercial activity in other sectors—such as in-space manufacturing and marketing products for sale on Earth—has yet to materialize. It is too early to determine the extent to which private astronaut missions will help facilitate a commercial market in LEO. However, unless overall commercial demand expands markedly, future LEO platforms will not be viable without significant government financial support. In addition, the time needed to design, build, and launch CLDs increases the risk that, for an undetermined period, NASA may not have access to a habitable destination in LEO. Furthermore, without a stable LEO destination, commercial activities in LEO would be reduced to taking place on small, commercial spacecraft that offer limited time and space for such research.

THE LUNAR ECONOMY

While less mature than its efforts in LEO, NASA is also partnering with commercial industry to build, own, and operate space systems that the Agency can use to purchase services for its needs in and around the vicinity of the Moon. The Commercial Lunar Payload Services (CLPS) program and HLS program seek to fund commercial and private companies to deliver payloads, services, and astronauts to the lunar surface. NASA's CLPS program is working with U.S. companies such as Astrobotic, Firefly Aerospace, and Intuitive Machines to deliver science and technology to the lunar surface. The Agency's HLS program is working with commercial providers, Blue Origin and SpaceX, to build the HLS that will carry Artemis astronauts to the lunar surface and back to lunar orbit for their ride home to Earth aboard Orion. Like NASA's LEO initiatives, these commercial endeavors will require a significant financial investment by NASA and private companies until sufficient demand materializes from international entities, non-NASA governmental agencies, and the commercial sector.

CLPS vendors develop new lander technologies and provide delivery of payloads to the lunar surface without NASA controlling or overseeing the contractors' designs, systems, processes, or infrastructure. As designed, CLPS deliveries are contractor missions, not NASA's. And while this approach is likely to enable missions to the Moon that will cost NASA less than past missions,



Conceptual rendering of Firefly Aerospace Inc.'s Blue Ghost lunar lander for NASA's Commercial Lunar Payload Services program.
Source: Firefly Aerospace.

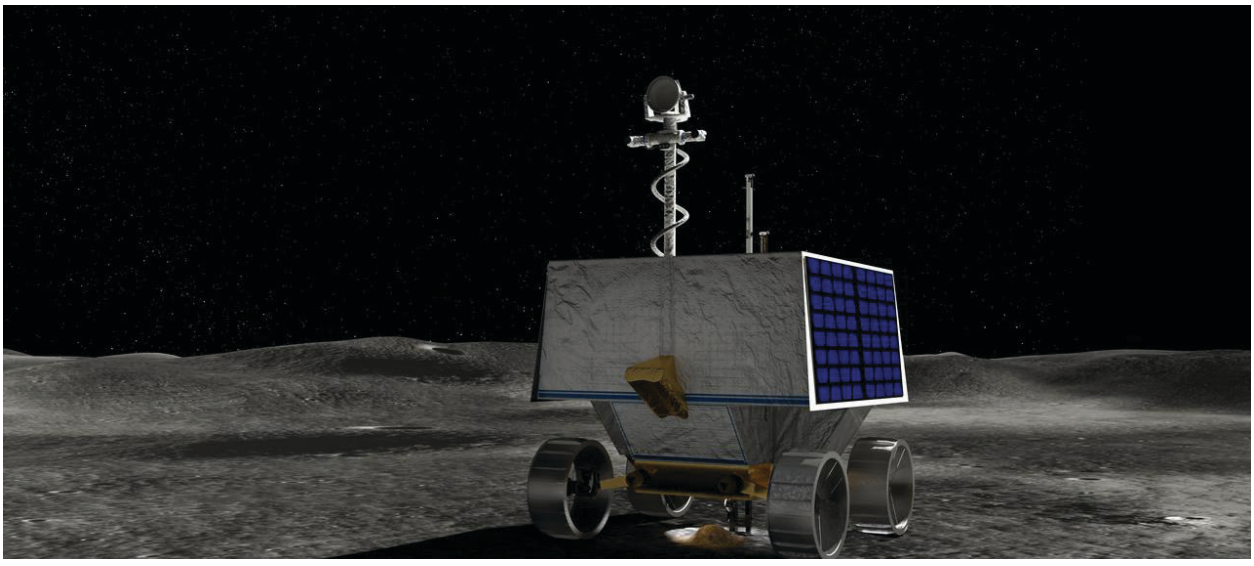
overly optimistic assumptions and deviations from design have led to CLPS missions costing a total of $208 million more than planned and delays averaging 14 months. In June 2024, we reported that there are three issues that have challenged NASA to effectively implement the CLPS initiative that are also likely to be common themes as the Agency transfers to more commercial and service-based approaches.

First NASA, misinformed by an optimistic market survey, was aggressive in the CLPS implementation schedule. NASA chose a hands-off strategy, using firm-fixed-price contracts to shift development and cost risks from NASA to vendors; the strategy also reduced NASA's involvement, access to vendor information, and ability to direct the vendors. The implementation became more challenging when the Agency also requested an aggressive delivery schedule of 2 to 3 years from task order award to lunar landing, which is far shorter than the average time to launch of about 44 months.

Second, NASA was aggressive in large lander development, which led to risk aversion practices costing CLPS more than designed. NASA deviated from the CLPS initiative's original intent by adding the Volatiles Investigating Polar Exploration Rover (VIPER) delivery as CLPS's fourth task order. NASA's decision to use a $199.5 million CLPS task order to fly VIPER, a large vehicle weighing approximately 500 kilograms (kg) with an initial estimated life-cycle cost of $433.5 million, was incompatible with an iterative approach that would allow CLPS to demonstrate successes at landing on the Moon, or to progress from smaller to larger lander sizes, which NASA has done in the past. The preponderance of NASA-owned payloads are light, estimated to weigh between 10 and 15 kg. Consequently, NASA management had a lower risk tolerance for the loss of VIPER than other payloads and, therefore, added more requirements, eventually resulting in $91.5 million more in task orders. In our judgment, adding VIPER to an early CLPS task order left little time or margin to demonstrate success of the smaller landers before committing to this larger lander, and diverted resources from refining smaller landers' capabilities through additional flight opportunities. In July 2024, NASA announced it was discontinuing VIPER development citing cost increases, delays to the launch date, and the risks of future cost growth.

Lastly, the schedule delays also reflected vendors' individual challenges. CLPS vendors are competitors in an emerging industry, developing modern space transportation capabilities and associated operations that have never been available. Vendors are encountering the expected technical issues and resulting delays. At the same time, a large amount of effort and investment are needed to assemble the teams and the facilities required to develop and build landers—one of the six vendors who received delivery task orders filed for bankruptcy in July 2022. Vendors are also facing challenges assembling the workforce they need to meet milestones, since skilled aerospace workers are in low supply and great demand. This created schedule delays and forced vendors to defer work to later in the development timeline.

NASA also faces challenges working with industry to develop the HLS that will carry astronauts to the lunar surface. NASA expects SpaceX to have its Starship HLS available to support Artemis III and IV and Blue



Conceptual rendering of NASA's Volatiles Investigating Polar Exploration Rover.
Source: NASA.

Conceptual rendering of Blue Origin's Blue Moon lander.
Source: Blue Origin.

Origin to have its Blue Moon lander available to support Artemis V. In the near term, technical difficulties associated with SpaceX's Starship HLS have delayed the Artemis III mission until September 2026. The extent of delays will depend on the outcome of multiple Starship flight tests and launches that SpaceX must conduct before using its lander variant with astronauts.

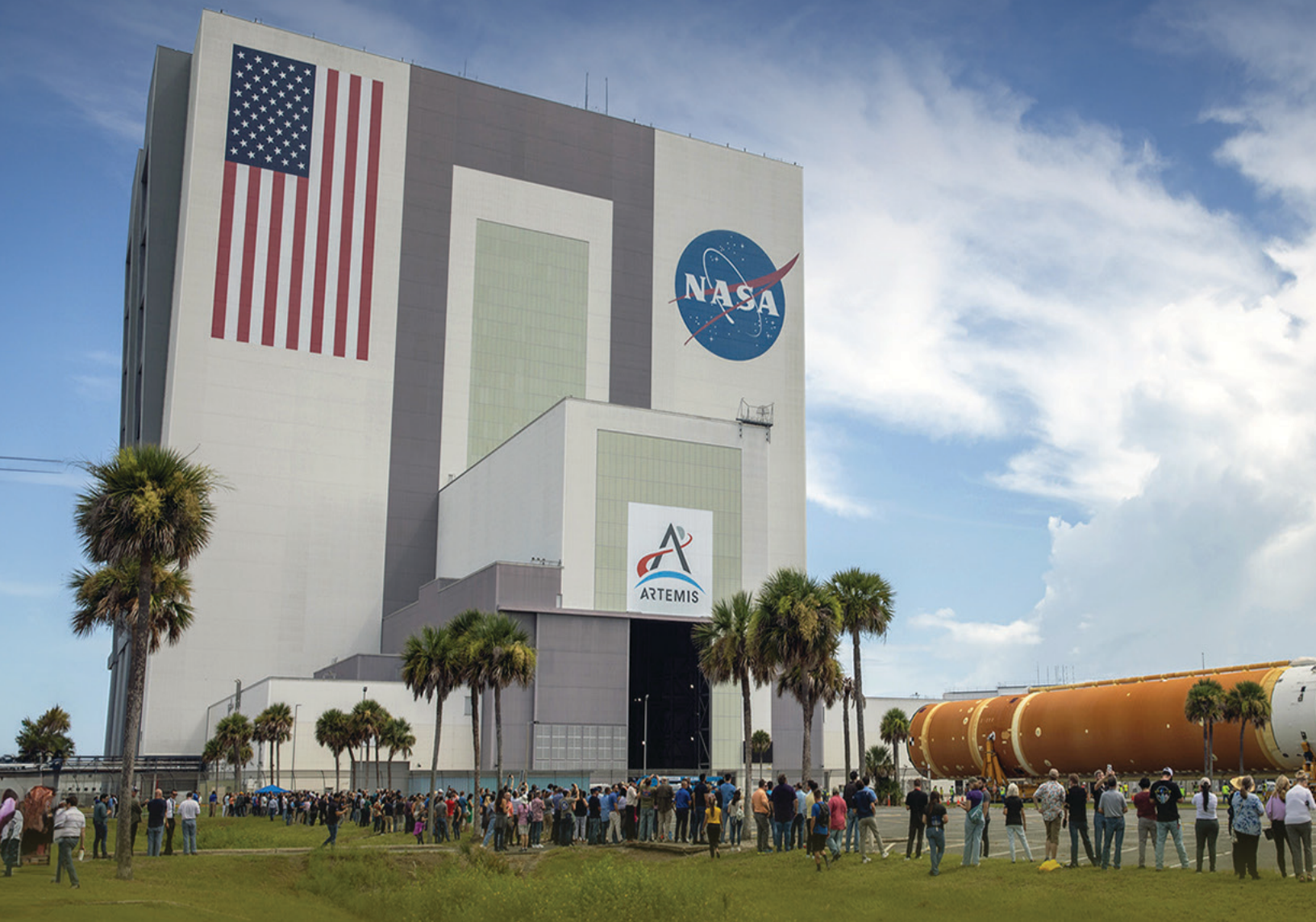
The challenge comes in balancing the speed of development and adherence to timelines against the safety and reliability of untried technology. To facilitate rapid development, encourage innovation, and reduce costs, NASA has given its HLS contractors significant latitude to implement their own project management practices with reduced Agency-required reviews and data submissions. To ensure the providers meet NASA's safety and operational requirements, the Agency is using a tailored insight and oversight model to gain visibility into broad aspects of the contractors' development work. While the effectiveness of this new strategy is still uncertain, there are often challenges associated with first-time developments.

For example, NASA's use of a modified firm-fixed-price approach for HLS will likely reduce costs compared to the Agency building it itself but may also exacerbate schedule and performance issues should the contractors be slow to meet certification requirements. Moreover, like the Commercial Cargo and Crew programs in their initial stages, contractor flexibility in meeting requirements provides the freedom to innovate; however, it also runs the risk of not meeting NASA requirements, especially when it comes to human rating the spacecraft. To its credit, NASA added specific design and construction standards to the demonstration contract with SpaceX to better ensure compliance with requirements as well as a special clause that strengthens the Agency's insight to ensure certification of flight readiness. Nonetheless, in our prior reviews of the Commercial Crew Program we noted a significant amount of verification work was needed to achieve flight readiness. Consequently, a challenge for NASA and its HLS partners will be the timely processing of documents and test results to verify compliance with Agency standards.

OIG Highlighted Work

- Audit of NASA's Commercial Lunar Payload Services Initiative
- NASA's Management of the International Space Station and Efforts to Commercialize Low Earth Orbit
- NASA's Management of the Artemis Missions

ENABLING MISSION CRITICAL CAPABILITIES AND SUPPORT SERVICES



Elements of the Challenge

- NASA faces challenges with its mission critical capabilities including attracting and retaining a highly skilled and diverse workforce and managing outdated infrastructure and facilities needed for science, aeronautics, and exploration missions.
- NASA's decentralized information technology management structure and lack of strategic leadership negatively affect the Agency's ability to protect and fully utilize computer systems and data vital to its mission.
- NASA's contract management practices have consistently led to increased costs and overly generous award fees.

Employees from Kennedy Space Center watch as teams transport the Space Launch System core stage for Artemis II to the Vehicle Assembly Building.
Source: NASA.

NASA's mission support services are critical to enable mission readiness and to continue the Agency's leadership in science, exploration, discovery, and innovation. To accomplish its diverse scientific and space exploration missions, NASA relies on mission critical capabilities including a highly skilled workforce, as well as specialized facilities and infrastructure. These mission critical capabilities are spread across NASA's 10 Centers and include more than 5,000 buildings and other structures, approximately 18,300 civil servants, and tens of thousands of contractors. Supporting mission critical capabilities are the information technology (IT) tools and data and procurement actions that support every facet of the Agency's operations. NASA has over 115,000 IT assets and a vast online presence that need to be secure to support internal and external stakeholders' use of the Agency's data. NASA also spends more than 80 percent of its annual budget on procurements through contracts, grants, and cooperative agreements that need to be executed efficiently and effectively to ensure that the Agency receives good value for its investments. Managing these critical capabilities and support services to ensure it has the right personnel, up-to-date facilities, secure IT systems, and cost-effective services, supplies, and equipment to accomplish its mission, is one of NASA's top management challenges.

MISSION CRITICAL CAPABILITIES

Workforce. NASA's workforce is an integral part of its mission critical capabilities and its greatest asset. The Agency continues to seek ways to attract, promote, and retain a diverse, multigenerational workforce that possesses the technical skills critical to the Agency's varied missions. For the past 12 years, NASA has been voted the best large agency to work for in the federal government. The Agency continues to modernize its human capital processes and talent acquisition systems and is working to expand its engagement with younger students to encourage them to enter Science, Technology, Engineering, and Mathematics (STEM) fields. Despite these efforts, our work has shown that NASA faces multiple workforce challenges.

Much like the broader federal government and commercial industry, NASA has struggled to recruit, hire, and retain STEM employees. At the end of 2023, approximately 64 percent of NASA employees worked in science and engineering occupations, yet the Agency remains at risk from a shortage of such staff due to increased competition for talent from the growing commercial space industry. NASA's STEM engagement efforts have faced significant challenges over the past two decades including shifting administration priorities and declining budgets. In April 2024, we reported that although NASA is making progress managing and coordinating STEM engagement activities, the Agency is missing opportunities to target the future workforce more directly. NASA has identified mission critical workforce needs with the majority in STEM occupations; however, the Agency designs engagement activities that focus on getting students interested in STEM more broadly as opposed to NASA's specific needs.

While NASA's workforce is dynamic, the Agency is also missing an opportunity to address mission critical workforce gaps. In 2022, an Independent Review Board found the Jet Propulsion Laboratory was having trouble attracting and retaining the workforce it needs for the Psyche mission, especially in critical technical occupations, many of which are STEM related. We have also repeatedly reported concerns with science projects competing for a limited technical workforce for projects that are preparing for launch in the next 3 to 5 years. Further compounding the issue is a large segment of the technical workforce at NASA is approaching retirement, which could affect its readiness for future missions. As of June 2024, approximately 31 percent of the Agency's science and engineering workforce is retirement eligible.

Students launched amateur rockets near Marshall Space Flight Center during the Agency's annual rocket competition.
Source: NASA.

Lastly, NASA has been challenged to increase diversity in its civilian workforce with the overall percentage of women and minority groups remaining unchanged for over a decade. While the Agency has had multiple initiatives to increase diversity, in April 2023 we reported NASA's lack of progress was because the Agency focused on meeting federal workforce requirements. Further, NASA struggled to hold its leaders fully accountable for advancing diversity, equity, inclusion, and accessibility (DEIA) efforts and to address gaps in professional development and training. To its credit, NASA incorporated leadership accountability for addressing DEIA goals within senior leaders' and supervisors' performance plans, established an Agency-wide mentoring program, and launched initiatives to incorporate Employee Resource Groups into recruiting activities.

Infrastructure. The second integral piece of NASA's mission critical capabilities are the Agency's facilities and infrastructure. Yet, much of NASA's current infrastructure dates to the Apollo-era of space exploration and is in marginal to poor condition. As of July 2024, more than 83 percent of NASA's facilities are beyond their original design life. Outdated facilities are more costly to maintain and, as of FY 2024, the Agency faced a deferred maintenance backlog of more than $3.8 billion, which continues to grow due to inflation and declining maintenance budgets.

NASA's Deep Space Network (DSN), which provides two-way communication links that guide and control spacecraft, serves as an example of the impacts outdated infrastructure can have on the Agency's missions. In July 2023, we reported much of the DSN's infrastructure, such as ground stations, had become dated as some of the infrastructure was originally built in the 1960s and was becoming increasingly difficult and costly to maintain. Concerningly, NASA missions that rely on DSN have suffered from insufficient communications capability and occasional failures as the network ages and limitations on bandwidth restrict the return of data. These failures could have significant impacts as experienced on flight day 18 of the Artemis I mission. On this day NASA encountered a 4.5-hour loss of communications with the Orion spacecraft when one of the three DSN facilities—Goldstone—experienced a site-wide outage. During this period, a total of 17 NASA and international partner missions were affected with thousands of minutes of telemetry data lost.

At the same time, other infrastructure exists that is being underutilized. In September 2024, we reported the demand for much of the Rocket Propulsion Test

NASA's Goldstone facility in California, one of three facilities that make up the Deep Space Network.
Source: NASA.

Program's test support infrastructure is underutilized. Specifically, NASA projects that only 10 of 38 test stands will be in use by 2026 primarily due to a change in NASA demand for large scale engine testing and increased commercialization of rocket propulsion.

NASA is working to reduce or eliminate aging infrastructure and facilities for which there is no current or future mission need. The Agency has options to retain the property in its present state, demolish the property, transfer the property to the General Services Administration for sale, or lease the property. Leasing is an option with the benefit of generating revenue the Agency can use to help reduce operation expenses and defray the costs of maintaining facilities. In FY 2024, NASA used 57 enhanced use leases to generate an estimated $23 million in cash and in-kind consideration. And since 2010, the Agency divested of approximately 7 million square feet of real estate. NASA has also been working to modernize the Agency's infrastructure into fewer, more sustainable facilities and repair, replace, or demolish failing infrastructure to reduce maintenance costs. Between FYs 2020 and 2024, NASA received more than $1.7 billion in funding that it used for construction projects and facility upgrades.

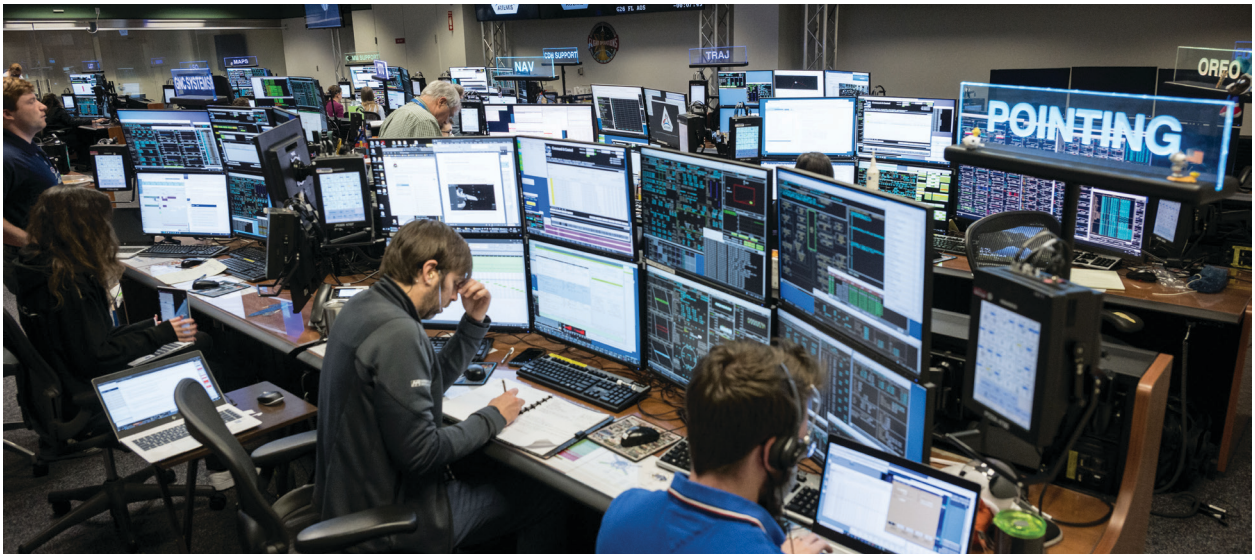
Lastly, NASA continues to face challenges with rebuilding and making its facilities and infrastructure more resilient following natural disasters, such as hurricanes and other weather-related events. Up to two-thirds of NASA's infrastructure lies within feet of sea level along coastlines placing these facilities at an increased risk from extreme weather events and longer-term environmental shifts such as rising sea levels. The Agency is already experiencing the budgetary impacts of these environmental related issues and requested funds outside of the Agency's normal budgetary cycle to repair and restore affected facilities.

INFORMATION TECHNOLOGY AND DATA

Every day, NASA personnel use IT to support the Agency's business, scientific, research, and space exploration activities. Nearly every piece of hardware in use on a NASA launch vehicle, spacecraft, ground system, or network requires software to monitor or control its operation. From desktop applications to critical mission IT systems used for Artemis, ISS, and the DSN, NASA uses IT to conduct its work and unleash the power of data.

Perhaps the least well-understood—but most complex use of IT—is sharing NASA data with foreign space agencies, universities, private companies, and the public while ensuring Agency IT systems are protected from cyberattacks. Generally, the Agency takes an open, collaborative approach to data sharing. For example, NASA publicly shares data on active fires, flooding projections, and weather modeling. Similarly, the Agency's approach to human space exploration is largely collaborative. With a vast digital footprint connecting nearly 70,000 users to agency networks, securing this environment is a continual challenge.

In an organization as technically complex as NASA, its workforce has competing priorities and real-time distractions that can divert attention from cybersecurity. NASA's latest Federal Information Security Modernization Act grade continues to underscore our concern—scoring IT maturity and overall health below the "managed and measurable" rating the Office of



Flight controllers in mission control at NASA's Johnson Space Center in Houston observe the Orion spacecraft during the Artemis I mission. Source: NASA.

Management and Budget considers effective. There are several key areas impacting NASA's cybersecurity, and its ability to navigate digital threats and safeguard IT assets and sensitive data. For example:

- Zero Trust Architecture (ZTA). ZTA—a continual cybersecurity framework focusing on "never trust, always verify"—is a pivotal enabler in the landscape of cybersecurity, but its implementation is far from straightforward. While NASA has begun its ZTA journey, the Agency faces challenges especially with identity management given the need to share scientific findings with national and international partners.
- Data Management and Privacy. Data is especially challenging—it is the most dynamic of all assets. Sensitive data grows and multiplies. With NASA's vast amount of data, both structured (databases and spreadsheets) and unstructured (documents, images, and videos), the Agency must ensure that it is properly categorizing, classifying, and tagging that information not only to protect, but also to share. NASA must find a way to comprehensively unify data management, inventory, security, and privacy within its nascent zero-trust environment. While security and privacy are independent and separate disciplines, they are closely related and require a coordinated approach to identify and manage risks. In December 2023, we found that the Agency needs to take additional steps to better protect individuals' personal data and information.

NASA is also challenged to continue leading efforts to utilize new and emerging technologies such as artificial intelligence (AI), machine learning, and other tools to further its mission while balancing the need for governance over and security of these technologies. For instance, the Agency has been a leader in high-end computing techniques for over a decade, providing critical processing power and time-saving capabilities that allow NASA and its partners to gain insight from large amounts of data that would take normal computers much longer to assess. However, in March 2024, we reported the Agency's history of innovation is being stymied by disjointed management and governance, which will require sustained leadership attention to reinvigorate these capabilities. NASA is also a leader in AI usage, with applications such as a storm prediction tool that uses image recognition technology and space vehicles such as the Mars Perseverance rover that uses an autonomous navigation system. Our May 2023 report highlighted the Agency's progress in establishing an AI governance framework but also identified the need for the Agency to classify and ensure continuous monitoring of AI to minimize vulnerabilities.

NASA's Office of the Chief Information Officer (OCIO) continues to transform and mature, focusing on a cyber framework that protects IT systems and its data. The OCIO designed and implemented an Agency-wide process limiting privileged access to computers. Importantly, this solution significantly reduced cyber risk at one NASA Center, which had the widest range of elevated privileges. Additionally, the importance of multifactor authentication—verifying the identity of a user using two or more factors—has continued to increase due to geopolitical tensions. As of May 2024, NASA increased multifactor authentication compliance to more than 85 percent; however, resolving the remaining legacy application technical barriers are currently in work. Lastly, the Agency is leveraging multiple funding opportunities. In April 2024, NASA received nearly $5.9 million to help meet federal mandates on cybersecurity. The OCIO also received approval to establish a new Working Capital Fund for IT Modernization, which includes $8 million of "no year" money, providing a more stable source of modernization and cybersecurity funding.

NASA is developing its humanoid robot Valkyrie to utilize artificial intelligence on future deep space missions.
Source: NASA.

PROCUREMENT

To support its operations, NASA uses contracts, grants, and cooperative agreements to fund research and development activities and to purchase services, supplies, and equipment. In FY 2023 the Agency obligated over $22 billion and executed over 34,000 procurement and assistance actions. NASA's FY 2023 procurement portfolio was composed of 34 percent firm-fixed-price contracts, 28 percent award-fee contracts, 28 percent cost-plus-fixed-fee contracts, and 10 percent other award types. The breadth and scale of these procurements underlie the significant challenges NASA faces to ensure the Agency receives good value for its investments and that recipients spend NASA funds appropriately to accomplish agreed-upon goals within the agreed-upon timetable.

Throughout its history, NASA has faced long-standing challenges with oversight of its contracts. One area NASA has struggled with over the years is to make the most appropriate contracting decisions. We have reported on the Agency's decision to sole source development contracts—such as those for the SLS's core stages, boosters, and engines and the Orion capsule—eliminating any potential cost benefits of competition. Moreover, competitive follow-on awards for production contracts for these items several years later were not feasible due to the high cost of a different contractor developing its own manufacturing processes and facilities.

Another area that we identified is NASA's management of its cost-plus contracts for development efforts such as the SLS, Orion, and ML-2. These programs have experienced years of delays and billions of dollars in cost increases, due in part to payment of overly generous award fees that we have found to be inconsistent with contractor performance. Award-fee contracts are designed to incentivize contractors and reward strong performance, and these fees are in addition to the amounts paid to reimburse them for actual costs incurred. We have reported on the inappropriate use of award fees during periods of poor contractor performance for multiple NASA programs and since 2020 questioned more than $77 million of award fees NASA paid for the SLS boosters and engines contracts, Orion contract, and the ML-2 contract. To its credit, NASA has taken steps to decrease the use of award-fee contracts over recent years from 42 percent in 2020 to 28 percent in 2023.

In addition to the longstanding issues we have identified in our audits, our Office of Investigations has uncovered fraud, waste, abuse, and misconduct in NASA's procurements. As of August 2024, half of our office's ongoing investigations relate to procurement fraud. Additionally, multiple cases we closed in the last 3 years have resulted in civil settlements; criminal convictions; and debarments of NASA contractors, grantees, and individuals. For example, the CEO of a Florida company pleaded guilty to wire fraud for submitting nearly 200 fraudulent quality control documents for parts destined for NASA's SLS. Overall, our investigative work has uncovered improper use of grant funds and fraud, which over the past 3 years resulted in 34 indictments, 24 convictions, 14 suspensions, and 20 debarments, with over $7.7 million in civil settlement fines returned to NASA. In addition, more than $9.6 million in criminal restitution and nearly $33.5 million in civil settlement fines were returned to the U.S. Treasury.

OIG Highlighted Work

- NASA's Rocket Propulsion Test Program
- Audit of NASA's Science, Technology, Engineering, and Math Engagement
- Audit of NASA's High-End Computing Capabilities
- NASA's Privacy Program
- Audit of NASA's Deep Space Network
- NASA's Management of Its Artificial Intelligence Capabilities
- NASA's Efforts to Increase Diversity in Its Workforce

APPENDIX A: ACRONYMS

AI	Artificial Intelligence
ARMD	Aeronautics Research Mission Directorate
CLD	commercial LEO destinations
CLPS	Commercial Lunar Payload Services
DEIA	diversity, equity, inclusion, and accessibility
DSN	Deep Space Network
FY	fiscal year
GAO	Government Accountability Office
HLS	Human Landing System
ISS	International Space Station
IT	information technology
JWST	James Webb Space Telescope
kg	kilograms
LEO	low Earth orbit
LTV	lunar terrain vehicle
MMOD	micrometeoroids and orbital debris
ML-1	mobile launcher 1
ML-2	mobile launcher 2
MSR	Mars Sample Return
OCIO	Office of the Chief Information Officer
SLS	Space Launch System
SMD	Science Mission Directorate
SpaceX	Space Exploration Technologies Corporation
STEM	science, technology, engineering, and mathematics
VIPER	Volatiles Investigating Polar Exploration Rover
ZTA	Zero Trust Architecture

APPENDIX B: MANAGEMENT COMMENTS

National Aeronautics and Space Administration

Office of the Administrator
Mary W. Jackson NASA Headquarters
Washington, DC 20546-0001

November 5, 2024

TO: Inspector General (Acting)

FROM: Administrator

SUBJECT: Agency Response to Office of Inspector General Draft Report, "2024 Report on NASA's Top Management and Performance Challenges"

The National Aeronautics and Space Administration (NASA) appreciates the opportunity to review and comment on the Office of Inspector General (OIG) draft report entitled, "2024 Report on NASA's Top Management and Performance Challenges" (Q-24-02-00-AOQA), dated September 30, 2024.

The Agency values the OIG's perspective on risks and vulnerabilities related to our programs and operations, as well as its recognition of progress we made addressing these challenges. As an Agency, we continue to aggressively pursue the mitigation and remediation of findings related to the audit recommendations issued by your office, including those that underpin your observations in your report.

We agree with the three broad areas outlined in your 2024 report and would like to highlight the following mitigation and remediation efforts relative to each challenge that either have been taken or are underway. We believe these efforts demonstrate NASA's commitment to addressing our most significant management and performance challenges.

Challenge 1: Improving the Management of Major Programs and Projects

NASA is at a historic inflection point, poised to advance the most significant series of science and human exploration missions in over a generation. The Agency continues to optimize the use of available resources in the pursuit of effective and efficient solutions that improve project management and support the advancement of ingenuity and innovation in space science, human exploration, and aerospace technology. NASA recognizes the inherent challenges of managing large, complex, often first-of-their-kind space flight and aeronautics programs and has worked over many years to improve policies and processes that control cost and schedule while ensuring safety and mission success.

The Chief Program Management Officer (CPMO)—a position established in the Office of the Administrator in 2022—is revitalizing NASA's project management community through various activities that include the annual project management symposium co-sponsored with the NASA Chief Knowledge Officer, the rollout of the NASA Project Management Network community of practice, and greater degrees of cross-Agency collaboration to improve and streamline program and project governing policies and tailoring processes. In addition, the CPMO assumed the Chair of the Program and Project Management Board and enhanced its

role tailoring proposals, identifying project management challenges, and discussing ideas to strengthen program and project management.

Since the OIG's 2023 report on management and performance challenges, the Deputy Administrator initiated a tiger team to identify ways NASA can further develop the risk management framework in support of Mission Directorates, Centers, and programs and projects to manage and communicate risk more effectively. As part of this study, a key area of focus was to assess how NASA can ensure realism in early formulation and provide Agency senior management officials with recommendations on how to mitigate early optimism. The study found optimism exists in pre-formulation regardless of mission category, as well as a lack of connectivity between pre-formulation program and project policy under NASA Procedural Requirements (NPR) 7120.5, NASA Space Flight Program and Project Management Requirements, and acquisition policy activities within NASA Policy Directive (NPD) 1000.5, Policy for NASA Acquisition.

In response to the study's findings, the Agency Program Management Council approved a series of recommendations intended to improve realism in early program and project formulation, strengthen NASA's acquisition management, and ultimately achieve improvements in the management of NASA's major programs and projects. NASA has already implemented a number of these objectives and is in the process of adjusting our approach to foster a greater balance between strengthening realism in early formulation and addressing early optimism. Specifically, NASA will be updating NPD 1000.5, NPR 7120.5, and the Standing Review Board handbook to include a Mission Concept Review (MCR) requirement; conducting independent assessments of Single Project Programs, Category 1 projects, and select Category 2 projects at MCR prior to Acquisition Strategy Meetings (ASM)—including independent cost estimates; updating ASM templates to ensure consideration of concepts such as risk management; and driving meaningful adoption of risk management principles across Agency processes through the permanent Agency Risk Management Officer position established within the Office of Safety and Mission Assurance.

With regard to the OIG's statement that NASA has not provided stakeholders with complete, credible, or timely cost and schedule commitments for major projects, NASA's governance and policy documentation requires Mission Directorates to set a baseline commitment prior to receiving leadership approval for formal entrance into the Implementation phase. The Agency has established Agency Baseline Commitments (ABC) for each project element of the Artemis Campaign—under the leadership of the Moon to Mars Program Office—and has set ABCs for projects over $250 million across Mission Directorates. NASA also regularly updates the Office of Management and Budget (OMB) and Congress on the performance and progress of our development projects.

NASA continues to uphold the highest standards for prudent financial management and reporting while strengthening our ability to accomplish our mission and contribute to maintaining American leadership in space, aeronautics, climate research, and innovation.

Artemis Campaign

NASA remains unwavering in our commitment to ensuring safe missions to low Earth orbit (LEO), the cis-lunar environment, and the lunar surface, reflecting our dedication to the safety of astronauts, mission success, and the advancement of human space exploration. The Exploration Systems Development Mission Directorate (ESDMD) continuously learns from past missions and incorporates lessons learned into future missions to enhance safety and performance. Through post-mission analyses, assessments, and feedback mechanisms, ESDMD identifies areas for improvement and implements corrective actions to optimize mission safety and effectiveness. As such, NASA appreciates OIG's recognition of the Agency's work to determine the root cause of the heat shield anomaly from Artemis I's flight.

Artemis implementation is also unique from other NASA activities in that a flexible architecture is a guiding principle within the Artemis Campaign, enabling NASA to adapt to changing requirements, leverage partnerships, and achieve sustainable and cost-effective human exploration of the Moon and beyond. By embracing flexibility and innovation, NASA aims to establish a robust infrastructure and lay the foundation for future exploration missions to Mars and beyond. NASA's approach helps to ensure that capabilities are developed to meet the needs of the architecture and are consistent with NASA policy and protocol under NPR 7120.5.

NASA is prioritizing both short-term cost containment and long-term mission objectives to achieve meaningful and impactful exploration and scientific discovery in space. To that end, as noted earlier, ABCs have been established for the following capability upgrades and programs associated with Artemis: Orion Crew Capsule, Space Launch Systems Block 1B Exploration Upper Stage and Associated Capabilities, the Gateway Program initial capability[1], the Human Landing System (HLS) initial capability, and Mobile Launcher 2 (ML2). With regard to the report's comments on ML2, the ABC established in June 2024 reflects the most current position of the project taking into consideration that ML2 has transitioned from design phase into construction phase. In prior estimates, the complete scope of ML2 was underestimated, but is now fully understood by prime contractor Bechtel National, Inc. (Bechtel) and risks associated with potential uncertainties have been included in NASA's estimate. NASA also worked with Bechtel to establish and negotiate an incentive plan to motivate cost and schedule performance. NASA also recognizes the significance of Artemis accountability and transparency highlighted in the report; however, OIG's internal projection of a flight-by-flight cost assessment as a benchmark on individual Artemis missions is inconsistent with the integrated design of the program and the Agency's obligation to include costs captured in their individual element at Phase E, Operations and Sustainment, which are generally five-year estimates.[2]

[1] The Power and Propulsion Element and the Habitation and Logistics Outpost make up the initial Gateway capability.

[2] This requirement can be found in NPR 7120.5, paragraph 2.4.1.6 (August 3, 2021).

International Space Station

The International Space Station (ISS or Station) Program's greatest accomplishment is as much a human achievement as it is a technological one—how best to plan, coordinate, and monitor the varied activities of many organizations and operations. An international partnership of space agencies representing five countries/regions (the United States (U.S.), Russia, Japan, Canada, and the European Union) provides, operates, and maintains the elements of the Station. Relying on and cooperating with international partners to transport crew and cargo is integral to the success of the science and research conducted on the Station. For our part, NASA continues to use commercial services to safely transport cargo and astronauts to the ISS to conduct critical research, science, and technology demonstrations. These operations inform and reduce risk for future missions to the Moon and Mars and provide insight and breakthroughs that directly affect life on Earth. NASA is working to solidify both a transition to commercial space station operations through our Commercial LEO Destinations Program (CLDP) and a controlled deorbit plan for the ISS.

The Communications Services project will deliver commercial communication services to the Near Space Network by the early 2030s and the CLDP will provide a seamless transition from the ISS to a commercial space station platform or platforms. Both of these have a tailored approach to implementing NPR 7120.5, allowing flexibility in the programmatic approach to account for commercial development aspects. Additionally, CLDP was the first program to conduct an independent review as part of its MCR after implementation of that requirement.

Russia has been authorized to continue participation in the ISS through 2028 and Congress has authorized U.S. participation through 2030. To mitigate uncertainty, NASA is developing a deorbit vehicle for the ISS. In June 2024, NASA and Roscosmos signed a memorandum agreeing to a contingency deorbit plan in case deorbit must occur prior to the arrival of the United States Deorbit Vehicle (USDV). NASA has contracted with Space Exploration Technologies Corporation (SpaceX) to provide the USDV by 2028 and will conduct a Systems Requirements Review in early 2025. While NASA concurs that this development timeline is brief, SpaceX is using heritage systems such as its Dragon capsule to support the USDV and NASA remains confident with the schedule.

Science and Aeronautics Research Missions

NASA's commitment to improving cost and schedule performance extends to the Science Mission Directorate (SMD), which has delivered 18 projects on budget between 2009 and 2022. NASA remains challenged to deliver large flagship projects that are developing first-of-its-kind technology, such as the James Webb Space Telescope and the Mars Sample Return (MSR) mission. The recommendations from the risk management tiger team described in the opening section of this response incorporate a pre-formulation MCR, an independent assessment of that review, and more stringent acquisition strategy requirements—all of which should contribute to better early cost estimates for flagship projects. NASA agrees with the OIG's assessment that cost recommendations from the Decadal Surveys that guide SMD's portfolio can result in unrealistic funding expectations, but NASA is confident that our new early formulation mission definition and cost estimation

efforts will mitigate these challenges in the future. However, it is important to note that even when cost and/or schedule assumptions prove overly optimistic, the Agency has taken steps to pause and reformulate missions. For example, SMD paused work on MSR and solicited new architecture proposals. NASA has also made difficult decisions to cancel projects for lack of performance.

While the report points to several performance and management challenges with the Aeronautics Research Mission Directorate's X-59 Low Boom Flight Demonstrator project, several activities and initiatives have been implemented to mitigate future concerns. New detailed reporting techniques and metrics were developed and implemented to enable prime contractor Lockheed Martin Corporation (Lockheed Martin) and NASA to better track progress and maintain insight into performance throughout discoveries of one-of-a-kind aircraft testing. Test approaches were, and continue to be, refined to identify minimum requirements that safely and effectively support system testing progress with minimum schedule margin loss. NASA also maintains a consistent onsite presence to maximize issue resolution and collaboratively address challenges with Lockheed Martin.

Lastly, NASA appreciates OIG's recognition of recent efforts to utilize Standing Review Boards, Independent Review Boards, and independent assessment to continue to improve program management. As a key element in NASA's strategic framework for managing major programs and projects, these areas help to ensure appropriate program and project management oversight to increase the likelihood of mission success.

Challenge 2: Partnering with Commercial Industry

The Low Earth Orbit Economy

NASA agrees that a sustained presence in LEO will be critical in carrying out NASA's research and exploration missions. NASA continues to work with its industry and commercial partners to refine the plan to transition from the ISS to Commercial LEO Destinations (CLD) later in the decade. NASA recognizes that work remains to be done to avoid a gap as part of this transition, and NASA's CLDP, Commercial Crew Program, and ISS Program are working together as parts of a LEO ecosystem. In 2024, NASA began work on a LEO Microgravity Strategy, using the same goals and objectives approach used to develop the Moon to Mars Strategy, to ensure that our future needs in LEO are clearly identified and are accounted for in our procurement of CLDs. The LEO Microgravity Strategy work is ongoing and has included several internal and external stakeholder feedback gathering activities to ensure future needs are taken into account. Successful implementation of the LEO Microgravity Strategy work, combined with the forthcoming CLD Phase 2 Agency acquisition strategy decisions, will ensure continued U.S. leadership in LEO and a successful transition from ISS to a commercial LEO economy.

The Lunar Economy

NASA agrees that pioneering new technologies and missions often involves uncertainty and embraces the difficulties and challenges of first-time development by fostering a culture of innovation, collaboration, and resilience. NASA's ESDMD, under the Artemis Campaign, is

working with the commercial industry to return to the Moon quickly and sustainably. Building on our experiences and partnerships, we are enabling a new lunar economy with private partners to deliver science and technology to the Moon, build and resupply the Gateway, provide crew transportation from orbit to the lunar surface, and more.

Space exploration development is an incredibly complex and challenging endeavor. It requires cutting-edge technology, significant financial investment, and a deep understanding of various scientific disciplines, from engineering to astrobiology. The collaboration with commercial partners has significantly advanced human spaceflight capabilities and fostered a more sustainable space economy. By actively promoting open communication and interdisciplinary teamwork, NASA not only enhances problem-solving capabilities but also cultivates a spirit of curiosity and exploration, driving progress even in the face of adversity. These partnerships have encouraged the growth of the commercial space industry. By fostering competition and innovation, NASA has enabled other companies to enter the market, increasing overall capabilities that have led to advancements in various technologies, such as reusable rocket systems, which significantly reduce the cost of access to space.

NASA applies diligent rigor to the buying of commercial services. NASA has implemented several key strategies to help commercial partners successfully meet our requirements and schedules. These strategies involve thorough evaluation of partner capabilities, experience, and track record; structured agreements setting expectations and accountability; and regular reviews, oversite meetings, and strict safety standards and assessments. Additionally, collaborative teams of NASA and commercial partners work together to maintain open lines of communication to quickly address any concerns that may arise. While NASA maintains ultimate authority on the Certification of Flight Readiness, NASA provides technical oversight and support throughout the development process with a focus area on risk reduction and design certification. All these strategies help to ensure success while safeguarding mission integrity and safety.

Commercial Lunar Payload Services

NASA's SMD manages a dynamic, complex portfolio of next-generation scientific programs that are extending the boundaries of humanity's understanding. NASA's Commercial Lunar Payload Services (CLPS) initiative has implemented an aggressive approach to stimulate the lunar economy. This innovative initiative, which partners with American industry, allows NASA to send science instruments and technology demonstrations to the lunar surface, eventually enabling humans to reach the lunar surface. Under the CLPS initiative, currently, 14 providers on contract are eligible to bid on task orders, both large and small.

NASA is excited by the opportunities made available through the CLPS program to advance science, technology, and exploration. In an effort to evolve and further optimize the CLPS program, SMD will critically review the CLPS programmatic and contract experiences to date, in coordination with the Office of Procurement and with the support and advice from the Office of the General Counsel, to incorporate changes and improvements based on what NASA and the CLPS providers have learned from those experiences to ensure we are meeting mission objectives that are enabled by CLPS.

Human Landing System

While ESDMD recognizes the challenges identified by the OIG, it is important to note that Congress has consistently and directly supported the public-private partnership approach taken to develop HLS systems and encouraged NASA to use firm-fixed-price partnerships as appropriate. Through firm-fixed-price contracts, clearly defined project scopes, deliverables, and performance metrics help establish expectations for both NASA and contractors. In these contracts, the contractor assumes much of the financial risk; therefore, NASA maintains a certain level of flexibility within the contract terms to address unforeseen challenges while still holding contractors accountable for their commitments. Overall, this approach promotes collaboration, encourages cost-effective solutions, and ultimately helps NASA achieve our exploration goals while minimizing financial exposure to the public taxpayer.

The HLS program uses risk-based insight as the implementation approach for the Government team to certify the integrated lander systems. Key components of the risk-based insight include risk management, safety reviews, testing and verification, data analysis, stakeholder engagement and implementation of lessons learned from past missions, and ongoing evaluation to enhance safety measures. Risk-based insight is integral to ensuring that the Artemis missions are conducted safely with a strong focus on the well-being of astronauts and the integrity of the mission objectives.

In addition to risk-based insight, the HLS program established integration teams that include personnel from both NASA and the commercial provider. These teams facilitate communication and collaboration on technical issues, helping NASA stay informed throughout the development processes. Commercial providers are required to provide regular documentation and participation documentation and reports on their development activities. This includes design documentation, test plans, and progress updates, which give NASA visibility into ongoing work. NASA participates in key testing phases, including design reviews, hardware testing, and simulations. This involvement allows NASA to observe and assess systems firsthand. NASA provides feedback based on their evaluations and observations, which helps guide development and ensures alignment with NASA's safety and performance standards.

The HLS collaborations with SpaceX and Blue Origin have made significant strides. SpaceX has successfully conducted five Starship test flights, each advancing technology with improvements in on-orbit attitude control, re-entry landing, splashdown capabilities, and a first-time milestone of returning the first stage booster back to its launch pad using giant mechanical arms. In 2025, SpaceX plans to undertake a long-duration flight test and a propellant transfer flight test. The critical design review for Artemis III's initial capability is set for summer 2025. SpaceX's ability to rapidly iterate designs and reduce costs through streamlined manufacturing processes offers valuable insights into how firm-fixed-price contracts can encourage innovation while managing risk.

Blue Origin will launch its first test flight of the New Glenn rocket no earlier than November 2024. Additionally, the Blue Moon lander, slated for the Artemis IV mission, has begun various testing phases at Kennedy Space Center. By developing technologies like the New Glenn and New Shepard rockets, Blue Origin showcases efficient project management and

engineering practices that can inform NASA's contracting strategies. Blue Origin's focus on collaboration and transparency with NASA helps refine the expectations and structures of firm-fixed-price agreements. These insights contribute to a better understanding of risk management, cost estimation, and performance evaluation—ultimately benefiting NASA's future contracting efforts.

NASA remains unwavering in our commitment to ensuring safe missions to the Moon, reflecting our dedication to the safety of astronauts, mission success, and the advancement of human space exploration. By fostering a collaborative environment, NASA encourages open communication, enabling both organizations to share insights, challenges, and solutions as development progresses.

Challenge 3: Enabling Mission Critical Capabilities and Support Services

The work of NASA's mission support community is foundational to mission success. We strive to provide the tools, people, and capabilities to ensure NASA's leadership position in aerospace, science, and exploration. The following highlights the Agency's efforts relative to this challenge.

Mission Critical Capabilities

Workforce

The Agency remains committed to tackling workforce issues and building a stronger talent pipeline to accomplish NASA missions. NASA's Office of the Chief Human Capital Officer modernized the recruiting process and developed a coordinated recruitment strategy using a standardized approach leveraging digital platforms to engage with prospective candidates. A critical piece of the recruitment strategy focuses on increasing workforce diversity by reaching new talent communities and establishing NASA as an employer that celebrates diversity and inclusion as keys to success. NASA has received multiple awards in 2022, 2023, and 2024 in recognition of our outreach and employment of under-represented groups.[3] To ensure success, NASA continually measures efforts and iterates our recruitment strategy. Multiple hiring authorities are utilized to quickly fill positions as well as pay incentives to recruit the right skills into the Agency.

The NASA 2040 initiative, launched in June 2023, brings a new focus in aligning our institutional operations to our priority mission needs. This initiative aims to drive meaningful changes that ensure NASA remains the global leader in aerospace and science. As part of this initiative, NASA is refining the Agency's workforce planning process to attract, develop, and retain a diverse, talented workforce aligned with future mission demands, to include pipeline development and talent exchanges.

[3] The awards included: America's Best Employers for Diversity (Forbes, 2023, 2022), America's Best Employers for New Graduates (Forbes, 2024, 2023, 2022), America's Best Employer for Veterans (Forbes, 2023, 2022), America's Best Employers for Women (Forbes, 2024, 2023, 2022), Ranked #1 Most Prestigious Internships (Vault/Firsthand, 2023), Top 20 Government Employers (STEM Workforce Diversity Magazine, 2023), and Top 20 Government Employers (Woman Engineer Magazine, 2023).

For the last five years, NASA has infused our Employee Value Proposition (EVP) into Agency recruitment and outreach efforts to attract candidates to the mission. The EVP is NASA's promise to the employee on what they will gain from their time at the Agency. As part of NASA 2040, NASA's EVP was refreshed and the Agency plans to use our four core elements to engage leaders and supervisors to drive culture change through creating a compelling work environment and experience for employees, continually integrating the EVP into all internal communications channels, and infusing EVP marketing across the employee life cycle.

NASA maintains a modern career website and is focused on building a digital recruitment presence which allows us to reach over 6 million followers on LinkedIn and other social media sites. Our digital presence helps us cultivate talent communities that help engage underrepresented groups, such as women in science, technology, engineering, and mathematics (STEM) and individuals with disabilities. NASA uses recruitment strategies to find candidates who are interested in working at NASA and provides valuable information to jobseekers so they can better understand NASA's values, the types of positions filled by NASA, and information about the Federal application process. The Offices of STEM Engagement, the Chief Human Capital Officer, and Diversity and Equal Opportunity partner to ensure the Agency's varied outreach and recruitment efforts are aligned to ensuring the NASA workforce is representative of the American workforce.

NASA continues to advocate for workforce flexibilities that support our ongoing needs to meet our critical hiring needs. NASA has worked with the Office of Personnel Management to obtain direct hire authority to meet our critical hiring needs to support our mission to return human missions to the moon, human and robotic missions to Mars and other destinations, addressing climate change, and positioning our Nation as the leader in civil aerospace and aviation.

Organizations across NASA are engaged in growing the STEM workforce pipeline broadly by investing in internship and fellowship programs sponsored by NASA Mission Directorates. NASA's Pathways Internship Program hires interns aligned with NASA's future workforce needs, providing experiences that prepare students for a career at NASA and an opportunity for full time employment upon graduation. NASA's Office of STEM Engagement engages more than 2,000 students annually in hands-on internships. NASA's STEM engagement opportunities inherently align with NASA's mission critical workforce needs because they are in STEM areas. Going forward, NASA's mission critical occupation workforce needs identified in the workforce planning process will be considered as part of the NASA Office of STEM Engagement's annual portfolio planning process.

Infrastructure

To address challenges with aging infrastructure and facilities, NASA is implementing a top-down, mission-driven Agency Master Plan (AMP). This plan ensures that the required infrastructure is available and affordable, guides Agency investments to prioritize mission critical assets, reduces the risk of unplanned failures, and guides divestment of assets not needed for the Agency's missions. The AMP will establish a 20-year vision for physical infrastructure and real property assets that aligns with current, evolving, and future mission requirements. NASA will use this process to identify critical capabilities and areas for asset

sustainment, investment, repurposing/out-granting, or divestment of infrastructure. To alleviate the maintenance burden, NASA's Office of Strategic Infrastructure (OSI) will continue to strongly advocate to increase its funding for demolition of unneeded facilities.

NASA released NPR 8820.2H, Facility Project Requirements, on September 27, 2022,[4] which included revisions due to OIG audits and other Agency studies of its organization and operations. Specifically, this revision included parameters for the assignment and use of institutional and programmatic Construction of Facilities (CoF) funds, the ability to identify cost-sharing as a funding method, a requirement for energy savings projects to conduct life cycle cost analyses, requirements to reduce and consolidate the Agency's footprint, tools to assist in the development of project requirements, and a definition of new Headquarters roles that will improve oversight of the implementation of CoF projects.

OSI concurs with the challenges identified that are associated with leasing NASA facilities to non-NASA entities (also referred to as out-grants). In 2017, OSI began to conduct an analysis on the Agency's leasing policies, procedures, and practices. As a result of this analysis, in 2020, NASA decided to centralize real estate functions across all Centers to OSI's Facilities and Real Estate Division (OSI-FRED). Additionally, OSI-FRED recently completed updates to Title 14 of the Code of Federal Regulations (CFR)[5] to serve as the guidelines for the Real Estate Contracting Officer program that codifies the centralization of the real estate function to OSI-FRED. Along with this update, OSI-FRED completed the updates to NPD and NPR 8800 on NASA's Real Estate Management Program.[6] Both updates required a complete analysis of the Agency's Enhanced Use Lease Program to ensure that internal controls are established and that real estate agreements are properly coordinated with all stakeholders and are compliant with all rules, regulations, and laws. As a result of this process, NASA will be able to reduce the time to complete a lease agreement by up to 50 percent while ensuring full cost and fair market value are captured within the agreements.

NASA has also identified investment strategies using Reliability Centered Maintenance (RCM) principles to stave off the increasing deferred maintenance liability within the Agency. OSI-FRED is implementing a tiered maintenance approach with foundations of Condition-Based Maintenance principles for relevant and critical assets. These efforts will lead to optimized maintenance programs and prioritization of available operations and maintenance resources. OSI leadership continues to inform and carry forward advocacy for additional investments necessary to improve the condition of important building systems and facilities across the Agency. Ultimately, this will increase the availability and reliability of these critical assets to meet current, emerging, and future mission needs. Implementation of these RCM principles ensures that the right type of maintenance is performed on the most critical assets, at the right time, and for the right reasons. RCM, paired with immediate investments in the replacement of obsolete items associated with the Agency's higher-

[4] NASA revised this version and issued NPR 8820.2I in September 2024.

[5] 14 CFR, "Aeronautics and Space," Part 1204, "Administrative Authority and Policy," Subpart 5, "Delegations and Designations."

[6] NPD 8800.14F, Policy for Real Estate Management (August 15, 2024) and NPR 8800.15F, Real Estate Management Program (October 8, 2024).

criticality assets, can provide near-term corrective mitigation for known risks and avoid mission/schedule impacts. These maintenance strategies focus on increasing equipment availability and avoiding disruptive failures and unplanned repair costs.

These initiatives will mitigate the Agency's ongoing challenge of aging and outdated infrastructure and facilities. Through the implementation of the AMP integrating and prioritizing projects using a "One NASA" approach and the ongoing investments in maintenance, demolition, repair, recapitalization, and out-granting, NASA continually strives to right-size the Agency's infrastructure toward more modern and efficient facilities that will continue to provide a robust real property asset portfolio for NASA mission objectives.

Information Technology and Data

In June 2023, the Office of the Chief Information Officer filled the Chief Data Officer (CDO) position and in May 2024 formalized and appointed the Chief Artificial Intelligence Officer (CAIO). The CDO is working to develop a NASA Interim Directive as an initial policy to establish key data governance roles and a federated data governance framework. The objective is to build a comprehensive and collaborative approach to governing the Agency's most critical data. The CDO is also drafting the fiscal year (FY) 2025 – FY 2027 NASA Data Strategy that focuses NASA on building foundational data management practices enabling an Agency-level data catalogue, metadata management and standards, as well as maturing data acumen across the Agency. The NASA Data Strategy will align to NASA's mission and goals to include implementing a Zero Trust Architecture and artificial intelligence (AI) governance. Lastly, the CDO team works closely with the Agency Privacy Officer to assure that CDO policies and standards account for specific guidelines and mitigate any risks associate with NASA personally identifiable information.

The Agency's intent for AI is to maximize the value AI provides to NASA while also managing AI risks. In compliance with Administration directives and guidance[7] the CAIO established NASA's Artificial Intelligence Strategy Board and Artificial Intelligence Strategy Working Group as the initial steps in building the NASA AI governance framework. The CAIO has begun an AI Registry effort with a focus on completing a full inventory of AI, categorizing the AI use to understand how it should be monitored and governed, and collecting OMB-reportable AI use cases to include identification of potential safety and human rights use cases. The AI Registry provides an understanding of AI use across NASA, informs AI governance processes, and facilitates collaboration and shared awareness of AI success so they may be reused rather than duplicated by AI adopters. In partnership with the Office of the Chief Human Capital Officer and the NASA Digital Transformation Officer, the CAIO co-sponsored a "Summer of AI" campaign that reached more than 4,000 unique participants across 40 events over the span of three months, transforming the way our Agency approaches AI awareness training and upskilling. In partnership with the Digital Transformation Officer, CAIO launched AI-ready workshops to facilitate organizational planning for AI adoption as part of annual organizational Digital Transformation Implementation Plans. The CAIO is recruiting for additional AI staff to lead the policy,

[7] Executive Order 14110, "Safe, Secure, and Trustworthy Development and Use of Artificial Intelligence," and OMB Memorandum M-24-10, "Advancing Governance, Innovation, and Risk Management for Agency Use of Artificial Intelligence."

strategy, governance, and adoption of innovative AI technologies in support of NASA's missions and mission support functions.

Procurement

The following highlights the Agency's efforts relative to challenges related to the oversight of contracts, award fees, procurement fraud avoidance, and improper use of NASA grant funds.

Oversight

NASA has improved contract oversight through various strategies. In FY 2024, the Office of Procurement obligated funds using a variety of contract/instrument types:

Instrument Type	Percentage of Total Obligations
Firm-Fixed-Price	31%
Cost-Plus-Award-Fee	28%
Cost-Plus-Fixed-Fee	23%
Cost-Plus-Incentive-Fee	6%
Grant	6%
Other *	6%

* includes Cost-No-Fee, Fixed-Price-Award-Fee, and Time-and-Materials

NASA acquisition professionals are equipped with tools, training, and processes to assist in analyzing risks to ensure that contract types align with Agency needs while balancing risk and incentives. When appropriate, contracting officers work with the program management community to ensure the maximum use of hybrid cost and fixed-price and/or fixed-price contractual instruments to minimize NASA cost-risk and incentivize successful contractor performance.

NASA continues to strengthen our contract administration and oversight of contract cost/performance risk through revitalization of the Procurement Management Review (PMR) process, which assesses compliance with regulations, and effectiveness of contract execution. The PMR process has instituted improvements such as quarterly corrective action plan reviews, development of an organizational health rating scheme, and the addition of special focus areas to identify cost control risks.

Award Fees

Award fees are a critical acquisition management tool by which the Federal Government can incentivize enhanced contractor performance during the execution of a design and development type contract. The NASA Federal Acquisition Regulation Supplement was revised to implement an independent award fee panel for procurements over $1 billion. This independent Agency-level panel provides stakeholder confidence of award fee scores that reflect unbiased assessments of contractor performance. NASA also developed the new Peer Review policy (comparable to the Department of Defense peer review process) for review of any actions valued over $1 billion.

In addition, NASA leveraged our Enterprise Pricing Office (EPO) responsible for the design, implementation, successful execution, and sustainment of the contract pricing, audit, and closeout capability across NASA's enterprise. The EPO created a dedicated vendor management role focused on driving more effective and strategic relationships with our key vendors. One of the primary goals of this role is to significantly enhance pre-negotiation positioning, ensuring that contract negotiations begin with a clear, data-driven understanding to motivate vendor performance, pricing trends, and market conditions. The role also allows standardization of best practices, enhanced risk mitigation, and more streamlined procurement processes to improve compliance.

Procurement Fraud Avoidance and Improper Use of Grant Funds

NASA has added several strategic efforts to strengthen processes and meet the challenges of contract management, thus securing better value and improving contract oversight of vendor performance:

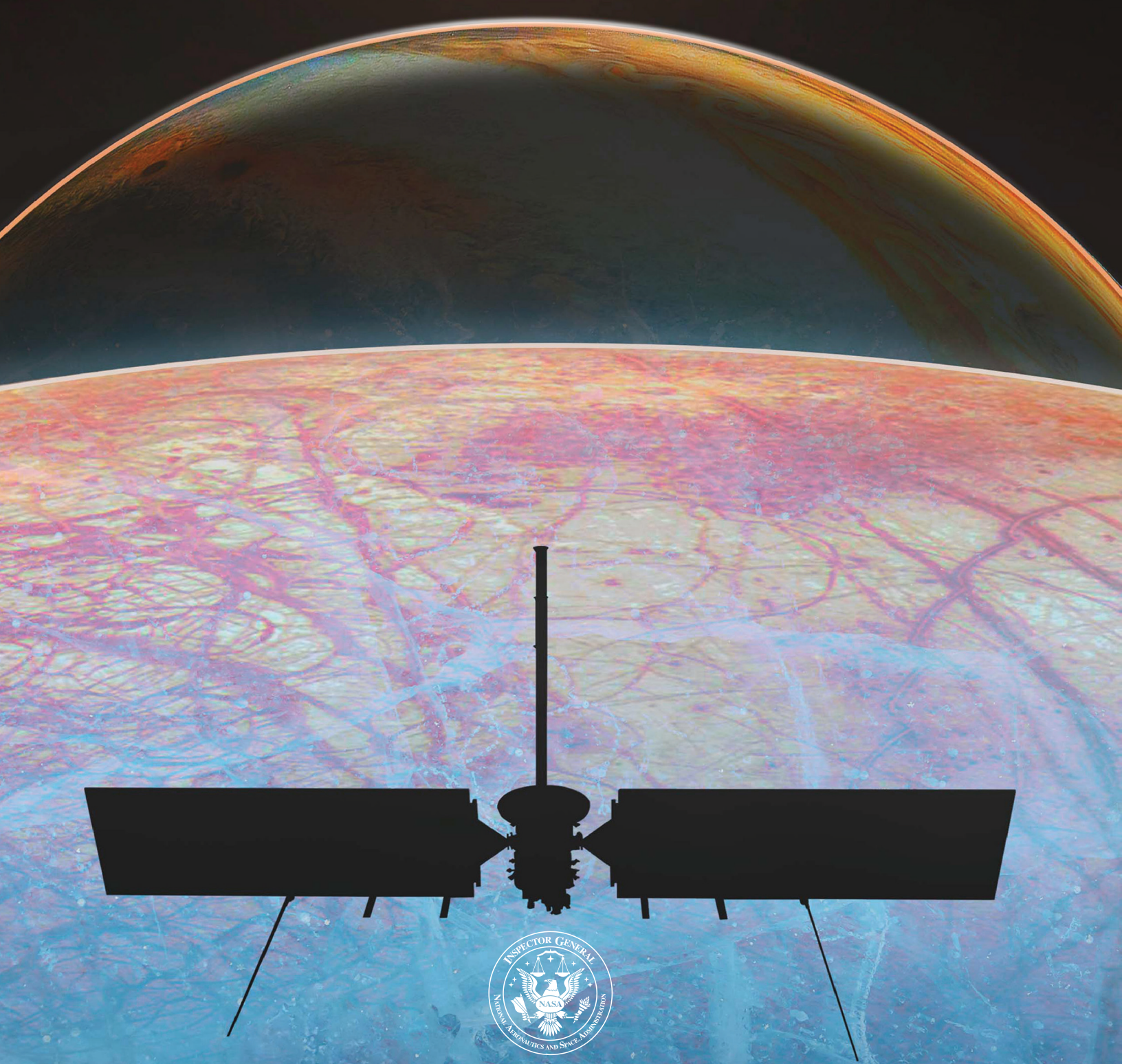
- Sustaining Vendor Management: Centralizing vendor oversight and refining pre-negotiation strategies to achieve more favorable contract terms, improve consistency in vendor performance, and optimize procurement outcomes across the Agency.
- Pricing Academy: A comprehensive training program designed for contracting professionals to provide in-depth instruction on pricing strategies, cost analysis, and negotiation techniques.
- Development of Prices Paid Capabilities: Focused on robust data analytics and reporting tools to track and analyze prices paid across various contracts and vendors. This capability will enhance benchmark pricing, offer cost-saving opportunities, and ensure greater transparency and accountability in procurement practices.

In addition, NASA launched initiatives to increase monitoring of grants together with integrating revisions to 2 CFR, "Office of Management and Budget Guidance for Federal Financial Assistance," into policy and processes. These updates equipped NASA with the tools to monitor distribution of funds to combat fraud, waste, and abuse. One of the more proactive monitoring approaches included Transaction Testing Reviews. These reviews require the grant officer to randomly select a quarter of grantee expenditures and review for questionable costs. The reviews are conducted at least once every five years for each award during its period of performance. In addition to Transaction Testing Reviews, the grant officer reviews Federal Financial Reports on a semi-annual basis and the grantees must provide explanations for any on-hand cash, as well as any anomalies identified. Finally, all out-year (i.e., future) funding now requires the NASA technical officer's concurrence prior to funding action in addition to the grantee's annual Performance Report.

These proactive measures allow NASA to closely monitor the grants for improper use of grant funds. In FY 2024, NASA conducted 968 Transaction Testing Reviews and 6,738 Federal Financial Report reviews. It is important to emphasize that outcomes such as convictions, indictments, debarments, and suspensions typically result from investigations that span several years. Consequently, it is likely that the awards reported by the OIG pertain to grants issued before NASA's new enhanced monitoring procedures were implemented.

Thank you for the opportunity to review and comment on the draft 2024 Report on NASA's Top Management and Performance Challenges, as well as provide additional updates on the important progress we have made. If you have any questions regarding NASA's response, please contact Mark Jenson, GAO/OIG Audit Liaison Program Manager, at (202) 358-0629.

cc:
Chief Financial Officer/Ms. Schaus
Chief Information Officer/Mr. Seaton
Associate Administrator for Aeronautics Research Mission Directorate/Mr. Pearce
Associate Administrator for Exploration Systems Development Mission Directorate/
Ms. Koerner
Associate Administrator for Science Mission Directorate/Ms. Fox
Associate Administrator for Space Operations Mission Directorate/Mr. Bowersox
Assistant Administrator for Procurement/Ms. Smith Jackson
Assistant Administrator for Strategic Infrastructure/Mr. Carney
Chief Human Capital Officer/Ms. Elliott



2024 Report on NASA's

TOP MANAGEMENT and PERFORMANCE CHALLENGES

Back Cover Photo: Conceptual rendering of the Europa Clipper spacecraft flying over Jupiter's moon, Europa. The Europa Clipper mission launched on October 14, 2024, and is intended to perform dozens of close flybys to investigate whether the moon could have conditions suitable for life. Source: NASA.