June 17, 2024

The Honorable Bill Nelson
Administrator
National Aeronautics and Space Administration
300 E Street Southwest
Washington, DC 20546

Priority Open Recommendations: National Aeronautics and Space Administration

Dear Administrator Nelson:

The purpose of this letter is to provide an update on the overall status of the National Aeronautics and Space Administration's (NASA) implementation of GAO's recommendations and to call your continued personal attention to areas where open recommendations should be given high priority.[1] In November 2023, we reported that, on a government-wide basis, 75 percent of our recommendations made 4 years ago were implemented.[2] NASA's recommendation implementation rate was 84 percent.

As of June 2024, NASA had 34 open recommendations. Fully implementing these open recommendations could significantly improve agency operations.

Since our May 2023 letter, NASA has implemented four of our nine open priority recommendations.[3] Specifically:

- NASA established baselines necessary for tracking cost and schedule performance for several Artemis program capability upgrades, which addressed three of our open recommendations.[4] Specifically, in August 2021, NASA updated its space flight program and

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[1]Priority recommendations are those that GAO believes warrant priority attention from heads of key departments or agencies. They are highlighted because, upon implementation, they may significantly improve government operations, for example, by realizing large dollar savings; eliminating mismanagement, fraud, and abuse; or making progress toward addressing a high-risk or duplication issue.

[2]GAO, *Performance and Accountability Report, Fiscal Year 2023*, GAO-24-900483 (Washington, D.C.: Nov. 15, 2023).

[3]GAO, *Priority Open Recommendations: National Aeronautics and Space Administration*, GAO-23-106496 (Washington, D.C.: May 3, 2023).

[4]GAO, *NASA: Actions Needed to Improve Transparency and Assess Long-Term Affordability of Human Exploration Programs*, GAO-14-385 (Washington, D.C.: May 8, 2014); *Space Launch System: Resources Need to be Matched to Requirements to Decrease Risk and Support Long Term Affordability*, GAO-14-631 (Washington, D.C.: July 23, 2014); *NASA Human Space Exploration: Significant Investments in Future Capabilities Require Strengthened Management Oversight*, GAO-21-105 (Washington, D.C.: Dec. 15, 2020).

project management requirements to clarify that capability upgrades will be treated as projects, which will include holding technical and programmatic reviews like other major development projects. At that time, NASA incorporated a docking capability upgrade into the Orion cost and schedule baseline. In December 2023, NASA established a new baseline for the Space Launch System (SLS) Block 1B capability upgrade. NASA is in the process of finalizing a cost and schedule baseline for the Mobile Launcher 2 and has plans to establish a cost and schedule baseline for the SLS Block 2 capability upgrade following a preliminary design review.

Establishing the separate cost and schedule baselines for these capability upgrades will provide decision makers transparency into costs and enable them to assess long-term affordability and progress.

- NASA provided evidence showing that it has assigned appropriate National Initiative for Cybersecurity Education framework work role codes to its positions in the 2210 Information Technology management occupational series and that it assessed the accuracy of position descriptions.[5] Accurately categorizing its positions will provide decision makers with reliable information that they can use to examine NASA's cybersecurity workforce and improve workforce planning.

We ask your continued attention to the remaining five priority recommendations. We are not adding any new recommendations this year. (See the Enclosure for the list of recommendations.)

The five priority recommendations fall into the following three areas.

Monitoring program costs and execution. NASA's acquisition management is one of the highest risks facing the agency due to the history of cost growth and schedule delays of its major projects. Implementing three priority recommendations in this area is critical for NASA to provide assurance that it will sustain the progress it has made toward addressing key acquisition management issues on its largest and most complex missions.

These recommendations primarily focus on improving transparency of long-term costs and the affordability of human spaceflight programs, as well as improving the reliability of data used to inform acquisition decisions. For example, NASA has yet to create a life-cycle cost estimate for the Artemis III mission, which is important as NASA plans for this mission to return U.S. astronauts to the surface of the moon in 2026.

Ensuring cybersecurity. We have been monitoring information security as a government-wide high-risk area since 1997.[6] We subsequently expanded this high-risk area to include protecting cyber-critical infrastructure and securing personally identifiable information.[7] Accordingly, federal agencies need to take urgent actions to ensure that they have programs in place to protect their information technology systems and sensitive information against increasing cyber risks. Our one priority recommendation in this area is aimed at defining and documenting the

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[5] GAO, *Cybersecurity Workforce: Agencies Need to Accurately Categorize Positions to Effectively Identify Critical Staffing Needs*, GAO-19-144 (Washington, D.C.: Mar. 12, 2019)

[6] GAO, *High-Risk Series: An Overview*, GAO/HR-97-1 (Washington, D.C.: Feb. 1, 1997).

[7] GAO, *High-Risk Series: An Update*, GAO-03-119 (Washington, D.C.: Jan. 1, 2003) and *High-Risk Series: An Update*, GAO-15-290 (Washington, D.C.: Feb. 11, 2015).

roles of key privacy officials. Implementing this recommendation will enhance NASA's ability to incorporate privacy protections into its systems.

Using federal contracting metrics. We found that the use of outcome-oriented performance metrics to manage procurement helps organizations determine whether they are achieving desired outcomes, such as reducing costs and improving performance. Our one priority recommendation in this area is for NASA to use a balanced set of performance metrics to manage the agency's procurement. This includes using outcome-oriented metrics to measure (a) cost savings/avoidance, (b) timeliness of deliveries, (c) quality of deliverables, and (d) end-user satisfaction. Using such metrics can help NASA make more informed management decisions.

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In April 2023, we issued our biennial update to our High-Risk List. This list identifies government operations with greater vulnerabilities to fraud, waste, abuse, and mismanagement. It also identifies the need for transformation to address economy, efficiency, or effectiveness challenges.[8] One of our high-risk areas—NASA Acquisition Management—centers directly on NASA.

Several other government-wide, high-risk areas also have direct implications for NASA and its operations. These areas include (1) improving the management of IT acquisitions and operations, (2) strategic human capital management, (3) managing federal real property, (4) ensuring the cybersecurity of the nation, and (5) government-wide personnel security clearance process.

In addition to NASA's high-risk area, we urge your continued attention to the other government-wide, high-risk issues as they relate to NASA. Progress on high-risk issues has been possible through the concerted actions and efforts of Congress, OMB, and the leadership and staff in agencies, including within NASA. In March 2022, we issued a report on key practices to successfully address high-risk areas, which can be a helpful resource as your agency continues to make progress to address high-risk issues.[9]

We also recognize the key role Congress plays in providing oversight and maintaining focus on our recommendations to ensure they are implemented and produce their desired results. Legislation enacted in December 2022 included a provision for GAO to identify any additional congressional oversight actions that can help agencies implement priority recommendations and address any underlying issues relating to such implementation.[10]

Congress can use various strategies to address our recommendations, such as incorporating them into legislation. Congress can also use its budget, appropriations, and oversight processes to incentivize executive branch agencies to act on our recommendations and monitor their

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[8]GAO, *High-Risk Series: Efforts Made to Achieve Progress Need to be Maintained and Expanded to Fully Address All Areas*, GAO-23-106203 (Washington, D.C.: Apr. 20, 2023).

[9]GAO, *High-Risk Series: Key Practices to Successfully Address High-Risk Areas and Remove Them from the List*, GAO-22-105184 (Washington, D.C.: Mar. 3, 2022).

[10]James M. Inhofe National Defense Authorization Act for Fiscal Year 2023, Pub. L. No. 117-263, § 7211(a)(2), 136 Stat. 2395, 3668 (2022); H.R. Rep. No. 117-389 (2022) (accompanying Legislative Branch Appropriations Act, H.R. 8237, 117th Cong. (2022)).

progress. For example, Congress can hold hearings focused on NASA's progress in implementing GAO's priority recommendations, withhold funds when appropriate, or take other actions to provide incentives for agencies to act. Moreover, Congress could follow up during the appropriations process and request periodic updates.

Congress also plays a key role in addressing any underlying issues related to the implementation of these recommendations. For example, Congress could pass legislation providing an agency explicit authority to implement a recommendation or requiring an agency to take certain actions to implement a recommendation.

Copies of this report are being sent to the Director of OMB and the appropriate congressional committees. In addition, the report will be available on the GAO website at Priority Open Recommendation Letters | U.S. GAO.

I appreciate NASA's continued commitment to these important issues. If you have any questions or would like to discuss any of the issues outlined in this letter, please do not hesitate to contact me or Timothy J. DiNapoli, Managing Director, Contracting and National Security Acquisitions, at (202) 512-4841 or dinapolit@gao.gov. Contact points for our Offices of Congressional Relations and Public Affairs may be found on the last page of this report. Our teams will continue to coordinate with your staff on all the 34 open recommendations, as well as those additional recommendations in the high-risk areas for which NASA has a leading role. Thank you for your attention to these matters.

Sincerely,

Gene L. Dodaro
Comptroller General
of the United States

Enclosure

cc: The Honorable Shalanda Young, Director, Office of Management and Budget
Mr. James Free, Associate Administrator, NASA
Ms. Cathy Koerner, Associate Administrator for Exploration Systems Development, NASA
Mr. Jeffrey Seaton, Chief Information Officer, NASA
Ms. Karla Smith Jackson, Associate Administrator for Procurement, NASA

Enclosure

Priority Open Recommendations to National Aeronautics and Space Administration

Monitoring Program Costs and Execution

NASA: Actions Needed to Improve Transparency and Assess Long-Term Affordability of Human Exploration Programs. GAO-14-385. Washington, D.C.: May 8, 2014.

Year Recommendation Made: 2014

Recommendation: To provide the Congress with the necessary insight into program affordability, ensure its ability to effectively monitor total program costs and execution, and facilitate investment decisions, the NASA Administrator should direct the Human Exploration and Operations Mission Directorate to establish a separate cost and schedule baseline for work required to support the Space Launch System (SLS) Block I Exploration Mission-2 (EM-2) and report this information to the Congress through NASA's annual budget submission.[11] If NASA decides to fly the SLS Block I beyond EM-2, NASA should establish separate life-cycle cost and schedule baseline estimates for those efforts, to include funding for operations and sustainment, and report this information annually to Congress via the agency's budget submission.

Actions Needed: NASA partially agreed with this recommendation. Officials stated that NASA defined and documented life-cycle costs for SLS to a first demonstrated capability, consistent with cost estimating best practices and NASA project and program management policy. In an August 2021 update to its program and project management policy, NASA changed the requirements for programs with an unspecified end point, like SLS. Specifically, NASA requires programs like SLS to establish a cost estimate for the initial capability and generate a 5-year operational cost estimate, with annual updates.

In spring 2022, the SLS program generated the first 5-year operational cost estimate, in accordance with policy. In spring 2024, NASA produced the first annual update, and officials told us the new estimate includes costs for Artemis II. However, in September 2023, we found that the 5-year operational cost estimate did not track costs by Artemis mission, nor by recurring SLS production items, so it was a poor measure of cost performance over time.[12]

To fully implement this recommendation, NASA needs to provide additional detail in its cost estimates and take steps to provide this information to Congress. For example, NASA should identify the costs associated with the SLS Block 1, such as by Artemis II or III mission or production item and provide that to Congress. Taking these actions would provide Congress with insight into the program's affordability and facilitate investment decisions.

High-Risk Area: NASA Acquisition Management

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[11]EM-2 was renamed Artemis II when NASA renamed its efforts to return to the moon and eventually travel to Mars.

[12]GAO, *Space Launch System: Cost Transparency Needed to Monitor Program Affordability*, GAO-23-105609 (Washington, D.C.: Sept. 7, 2023).

Director: William Russell, Contracting and National Security Acquisitions
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Space Launch System: Resources Need to Be Matched to Requirements to Decrease Risk and Support Long Term Affordability. GAO-14-631. Washington, D.C.: July 23, 2014.

Year Recommendation Made: 2014

Recommendation: To provide the Congress with the necessary insight into program planning and affordability, and to decrease the risk of cost and schedule overruns, NASA's Administrator should direct the Human Exploration and Operations Mission Directorate to identify a range of possible missions for each future SLS variant that includes cost and schedule estimates and plans for how those possible missions would fit within NASA's funding profile.

Actions Needed: NASA agreed with this recommendation. NASA has taken steps to identify a range of missions for future SLS variants. For example, in May 2022, NASA provided a draft document which aligns the SLS variants by mission through Artemis IX. NASA also plans to demonstrate the SLS Block IB initial capability on the Artemis IV mission and the SLS Block 2 initial capability on the Artemis IX mission. NASA has established or plans to establish cost and schedule baselines for the SLS Block 1B and Block 2 development activities. After each new variant demonstrates its initial capability, NASA plans to include the operations and sustainment costs in the SLS program's 5-year operational cost estimate. However, in September 2023, we found that 5-year estimates of production and operations costs did not track costs by Artemis mission, nor by recurring SLS production items, so it was a poor measure of cost performance over time.[13]

To fully address this recommendation, NASA should identify the operations costs associated with the SLS Block 1B, beginning with Artemis V. For example, NASA could identify costs by mission or by production item. This information will help ensure the decision makers have information to make decisions about the affordability of the program within the agency's funding profile.

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NASA Lunar Programs: Opportunities Exist to Strengthen Analyses and Plans for Moon Landing. GAO-20-68. Washington, D.C.: December 19, 2019.

Year Recommendation Made: 2020

Recommendation: The NASA Administrator should ensure that the NASA Associate Administrator for Human Exploration and Operations creates a life-cycle cost estimate for the Artemis III mission.

Actions Needed: NASA agreed with the recommendation. Officials stated that NASA would provide a preliminary cost estimate for the Artemis III mission by the end of calendar year 2020. However, NASA has not yet created this cost estimate. NASA officials previously told us that a 5-year funding plan provided to Congress in September 2020 serves as the agency's cost

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[13]GAO, *Space Launch System: Cost Transparency Needed to Monitor Program Affordability*, GAO-23-105609 (Washington, D.C.: Sept. 7, 2023).

estimate through the Artemis III mission, which was at the time planned for 2024. The officials stated that the agency would establish cost and schedule commitments for projects but not the overall mission.

In March 2024 NASA told us that the agency has implemented a range of management and reporting tools to ensure transparency and accountability at the mission level for all stakeholders but that imposing a flight-by-flight cost assessment as a benchmark on individual Artemis missions could potentially hinder the success, innovation, and long-term sustainability of space missions.

To fully implement this recommendation, NASA needs to develop a life-cycle cost estimate for the Artemis III lunar landing mission as a whole. This is because the 5-year funding plan includes costs outside of this mission, such as costs for the Artemis II mission. Similarly, project baseline commitments do not necessarily include the scope of work required for the Artemis III mission. For example, the SLS baseline commitment included a cost estimate only for the Artemis I mission. As a result, there is no comprehensive Artemis III life-cycle cost estimate. Without an overall cost estimate for the Artemis III mission, decision makers have limited cost information to inform decisions on the overall lunar investment.

High-Risk Area: NASA Acquisition Management

Director: William Russell, Contracting and National Security Acquisitions
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Ensuring Cybersecurity

Privacy: Dedicated Leadership Can Improve Programs and Address Challenges. GAO-22-105065. Washington, D.C.: September 22, 2022.

Year Recommendation Made: 2022

Recommendation: The Administrator of NASA should fully define and document the role of the senior agency official for privacy or other designated privacy official in reviewing and approving system categorizations, overseeing privacy control assessments, and reviewing authorization packages.

Action Needed: NASA agreed with this recommendation. Officials stated the agency was developing plans to address it. As of March 2024, NASA had provided documentation of efforts taken to address this recommendation, including defining the roles of the Senior Agency Official for Privacy and other key privacy officials and showing how the privacy program is involved in system categorization and control assessments.

To fully implement this recommendation, NASA needs to provide documentation showing the Senior Agency Official for Privacy or other privacy officials are responsible for reviewing authorization packages. Taking these steps will help NASA ensure that privacy protections are adequately incorporated into its systems with personally identifiable information.

High-Risk Area: Ensuring the Cybersecurity of the Nation

Director: Jennifer Franks, Information Technology and Cybersecurity

Contact information: FranksJ@gao.gov, (404) 679-1831

Using Federal Contracting Metrics

Federal Contracting: Senior Leaders Should Use Leading Companies' Key Practices to Improve Performance. GAO-21-491. Washington, D.C.: July 27, 2021.

Year Recommendation Made: 2021

Recommendation: The NASA Administrator should ensure the NASA Senior Procurement Executive uses a balanced set of performance metrics to manage the agency's procurement organizations, including outcome-oriented metrics to measure (a) cost savings/avoidance, (b) timeliness of deliveries, (c) quality of deliverables, and (d) end-user satisfaction.

Action Needed: NASA agreed with the recommendation. In February 2022, the NASA Senior Procurement Executive shared plans to implement metrics in the future to measure (a) cost savings/avoidance, (b) timeliness of deliveries, and (c) quality of deliverables. As of February 2023, NASA reported it developed an E-Business Systems Office within the Office of Procurement (OP) that is responsible for defining and managing data and creating a Procurement Dashboard, metrics, and analytical data tools, among other things. In May 2023, NASA provided evidence that it was using an outcome-oriented metric to measure end-user satisfaction, using among other sources of data, a quarterly assessment of the OP by each of the NASA centers.

NASA's OP also provided an update on its efforts to collect data to measure cost savings/avoidance. The OP told us it that it established a mechanism to collect cost savings/avoidance data, but it encountered data quality issues. According to the OP, it is addressing these issues and expects to resolve them this calendar year. For the timeliness of deliveries and the quality of deliverables metrics, the OP established the procurement dashboard to assist in tracking and analyzing data from the Contractor Performance Reporting System and is working to address stakeholder input.

To fully implement this recommendation, NASA will need to provide evidence that it has implemented all the performance metrics to manage the agency's procurement organizations. Using a balanced set of performance metrics, including both process- and outcome-oriented measures can help federal agencies identify improvement opportunities, set priorities, and allocate resources.

Potential Financial Benefit if Implemented: $100 million or more annually.

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