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Comptroller General
of the United States

April 23, 2020

The Honorable James F. Bridenstine
Administrator
National Aeronautics and Space Administration
300 E Street Southwest
Washington, DC 20546

Priority Open Recommendations: National Aeronautics and Space Administration

Dear Administrator Bridenstine:

The purpose of this letter is to provide an update on the overall status of the National Aeronautics and Space Administration's implementation of GAO's recommendations and to call your personal attention to areas where open recommendations should be given high priority.¹ In November 2019, we reported that on a government-wide basis, 77 percent of our recommendations made 4 years ago were implemented.² NASA's recommendation implementation rate was 63 percent. As of March 2020, NASA had 48 open recommendations. Fully implementing all open recommendations could significantly improve NASA's operations.

Since our April 2019 letter, NASA has implemented 1 of our 9 open priority recommendations and we closed a second recommendation as not implemented. With respect to the implemented recommendation, NASA coordinated with the Secretary of Energy, the Secretary of Health and Human Services, and the Director of the National Science Foundation in several interagency efforts to standardize administrative research requirements. As a result, the agencies identified two potential areas for standardization or harmonization of requirements, such as the policy for what constitutes a financial conflict of interest. For the second, closed recommendation, NASA took some steps to assess opportunities for competition for future variants of the Space Launch System. However, NASA did not provide Congress with a comprehensive assessment of the extent to which development and production of future elements of the SLS could be competitively procured. There is no longer an opportunity within the current SLS program to take action on this recommendation.

NASA has 7 priority recommendations remaining from those we identified in the 2019 letter. We ask your continued attention on those remaining priority recommendations. We also are adding 5 new recommendations related to cost estimates for its human exploration missions and addressing cybersecurity concerns. This brings the total number of priority recommendations to 12. (See enclosure for the list of recommendations).

¹Priority 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 operation, for example, by realizing large dollar savings; eliminating mismanagement, fraud, and abuse; or making progress toward addressing a high-risk or duplication issue.

²GAO, *Performance and Accountability Report: Fiscal Year 2019*, [GAO-20-1SP](#) (Washington, D.C.: Nov. 19, 2019).

The 12 priority recommendations fall into the following two areas.

Monitoring Program Costs and Execution. NASA's acquisition management is one of the highest risks facing the agency. Many of our 10 priority recommendations in this area are focused on improving transparency into long-term costs and affordability of human spaceflight programs and improving the reliability of data used to inform acquisition decisions.

For example, in December 2019, we recommended that NASA create a life-cycle cost estimate for the Artemis III mission. NASA is planning for this mission to return U.S. astronauts to the surface of the Moon by the end of 2024. NASA agreed with the recommendation and stated that the agency will provide a preliminary cost estimate for the Artemis III mission by the end of calendar year 2020. Further, NASA stated that it will provide an updated cost estimate for the Artemis III mission after it establishes cost and schedule commitments for some of the projects that compose the lunar mission, currently planned for Spring 2021.

In addition, in July 2018, we recommended that NASA develop and maintain a contingency plan for ensuring a presence on the International Space Station (ISS) until a Commercial Crew Program contractor is certified. NASA agreed with this recommendation. NASA has identified potential solutions—including providing Extra-Vehicular Activity and robotics training for a subset of cosmonauts to support U.S. Operating Segment operations—but there is no contingency plan in place. To fully implement this recommendation, NASA needs to provide documentation of its contingency plan.

Implementing these priority recommendations in this area is critical for NASA to provide assurance that the progress the agency has made toward addressing key acquisition management issues will be sustained on NASA's largest and most complex missions.

Ensuring Cybersecurity. We have designated information security as a government-wide high-risk area since 1997 and subsequently expanded this high-risk area to include protecting cyber critical infrastructure and securing personally identifiable information. Accordingly, federal agencies need to take urgent actions to ensure that they have programs in place to protect their IT systems and sensitive information against increasing cyber risks. Our priority recommendations in this area are aimed at strengthening NASA's ability to implement such protections. For example, in July 2019, we recommended that the NASA Administrator should establish a process for conducting an organization-wide cybersecurity risk assessment. NASA agreed with this recommendation and stated that it will document its processes for conducting this risk assessment and expected to complete these actions by September 30, 2020.

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As you know, in 2019 we issued our biennial update to our high-risk program, which identifies government operations with greater vulnerabilities to fraud, waste, abuse, and mismanagement or the need for transformation to address economy, efficiency, or effectiveness challenges.³ Our high-risk program has served to identify and help resolve serious weaknesses in areas that involve substantial resources and provide critical service to the public.

One of our high-risk areas, [NASA Acquisition Management](#), centers directly on NASA. Several other government-wide high risk areas including (1) [improving management of IT acquisitions](#)

³GAO, *High-Risk Series: Substantial Efforts Needed to Achieve Greater Progress on High-Risk Areas*, [GAO-19-157SP](#) (Washington, D.C.: Mar. 6, 2019).

and operations; (2) strategic human capital management; (3) managing federal real property; (4) government-wide personnel security clearance process; and, as mentioned above, (5) ensuring the cybersecurity of the nation, also have direct implications for NASA and its operations. We urge your attention to these government-wide 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 NASA.⁴

Copies of this report are being sent to the Director of the Office of Management and Budget and appropriate congressional committees including the Committees on Appropriations, Budget, and Homeland Security and Governmental Affairs, United States Senate; and the Committees on Appropriations, Budget, and Oversight and Reform, House of Representatives. In addition, the report will be available at no charge on the GAO website at <http://www.gao.gov>.

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 the letter, please do not hesitate to contact me or Michele Mackin, Managing Director, Contracting and National Security Acquisitions, at MackinM@gao.gov or 202-512-4841. 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 of the 48 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 yours,



Gene L. Dodaro
Comptroller General
of the United States

Enclosure - 1

cc: The Honorable Russell Vought, Acting Director, OMB
Mr. Stephen Jurczyk, Associate Administrator, NASA
Mr. Douglas Loverro, Associate Administrator for Human Exploration and Operations, NASA
Ms. Renee Wynn, Chief Information Officer, NASA

⁴[GAO-19-157SP](#). See pages 222-226 for NASA Acquisition Management pages, 123-127 for Improving the Management of IT Acquisitions and Operations, pages 75-77 for Strategic Human Capital Management, pages 78-85 for Managing Federal Real Property, pages 170-177 for Government-wide Personnel Security Clearance Process, and pages 178-184 for Ensuring the Cybersecurity of the Nation.

Priority Open Recommendations to NASA

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.

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 (EM)-2 and report this information to the Congress through NASA's annual budget submission. If NASA decides to fly the SLS Block I beyond EM-2, 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, stating that it 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 and that it would report costs associated with the second exploration mission via its annual budget submission.

In January 2020, NASA stated that it is evaluating changes to NASA Procedural Requirements 7120.5E, "NASA Space Flight Program and Project Management Requirements," to better enable the necessary insight into program affordability and efficient monitoring of total program costs and execution for multi-year, multi-cadence type programs. Further, NASA stated that it is investigating plans to redefine performance expectations for multi-decade programs' formal commitments while maintaining visibility to the entire plan. To address this recommendation, NASA needs to establish separate cost and schedule baselines for work required to support SLS for EM-2, which is now known as Artemis II.

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 separate cost and schedule baselines for each additional capability that encompass all life-cycle costs, to include operations and sustainment. NASA intends to use the increased capabilities of the SLS, Orion, and Ground Systems Development and Operations efforts well into the future and has chosen to estimate costs associated with achieving those capabilities. When NASA cannot fully specify costs due to lack of well-defined missions or flight manifests, forecast a cost estimate range—including life-cycle costs—having minimum and maximum boundaries. These baselines or ranges should be reported to Congress annually via the agency's budget submission.

Actions Needed: NASA partially agreed with this recommendation, stating that it had established separate programs for SLS, Orion, and the ground systems and adopted a block upgrade approach for SLS. In January 2020, NASA stated that it plans to establish an agency baseline commitment for capability upgrades (e.g., Block 1B upgrades, such as Mobile Launcher-2 and Exploration Upper Stage) above the \$250 million threshold. A joint confidence

level analysis will be performed at key decision points and will include the cost and schedule range estimates for each of these upgrades. To address this recommendation, NASA needs to provide evidence that it established separate cost and schedule baselines for each additional SLS, Orion, and Ground Systems Development and Operations capability blocks that encompass all life-cycle costs, including operations and sustainment.

High-Risk Area: [NASA Acquisition Management](#)

Director: William Russell, Contracting and National Security Acquisitions

Contact information: russellw@gao.gov, (202) 512-4841

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.

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 structure each future increment of SLS capability with a total cost exceeding the \$250 million threshold for designation as a major project as a separate development effort within the SLS program. In doing so, NASA should require each increment to complete both the technical and programmatic reviews required of other major development projects, per the agency's acquisition and system engineering policies.

Actions Needed: NASA agreed with this recommendation. In January 2020, NASA stated that it planned to establish an agency baseline commitment for capability upgrades (e.g., Block 1B upgrades, such as Mobile Launcher-2 and Exploration Upper Stage) above the \$250 million threshold. A joint confidence level analysis will be performed at key decision points and will include the cost and schedule range estimates for each of these upgrades. To fully implement this recommendation, however, NASA needs to provide evidence that each capability upgrade is designated a major project and is required to complete the technical and programmatic reviews required of other major development projects.

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. In January 2020, NASA stated that new leadership at the Human Exploration and Operations Mission Directorate is conducting an internal independent assessment to assess the current schedule and technical approach for achieving a lunar landing by 2024, including the utilization of SLS for Artemis missions. With the insights gained from this assessment, NASA will move forward with planning and executing these missions through the annual budgeting process. To fully address this recommendation, NASA will need to identify cost and schedule estimates for possible SLS missions beyond its first exploration mission, now known as Artemis I, and how its planned missions would fit within NASA's funding profile.

High-Risk Area: [NASA Acquisition Management](#)

Director: William Russell, Contracting and National Security Acquisitions

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NASA: Earned Value Management Implementation across Major Spaceflight Projects is Uneven. GAO-13-22. Washington, D.C.: November 19, 2012.

Recommendation: To improve NASA management and oversight of its spaceflight projects, and to improve the reliability of project earned value management (EVM) data, the NASA Administrator should direct the appropriate offices to modify the NASA Procedural Requirements 7120.5 to require projects to implement a formal surveillance program that: (1) Ensures anomalies in contractor-delivered and in-house monthly EVM reports are identified and explained, and report periodically to the center and mission directorate's leadership on relevant trends in the number of unexplained anomalies. (2) Ensures consistent use of work breakdown structures (WBSs) for both the EVM report and the schedule. (3) Ensures that lower-level EVM data reconcile with project-level EVM data using the same WBS. (4) Improves underlying schedules so that they are properly sequenced using predecessor and successor dependencies and are free of constraints to the extent practicable so that the EVM baseline is reliable.

Actions needed: NASA partially agreed with this recommendation, stating that the reliability and utility of the EVM data needed to be improved but that it did not plan to implement a formal surveillance plan due to resource constraints. Since initially commenting on the report, however, in December 2018, NASA included an initiative in its Corrective Action Plan—a plan put in place in response to recent programmatic performance and NASA's designation on GAO's High-Risk List—to enhance EVM implementation. In June 2019, NASA issued EVM guidance that covered several items, including enhancing in-house and contracted earned value management surveillance and requiring EVM reporting at Baseline Performance Review. NASA officials reported that its near-term plans are well-defined to address the reliability of project EVM data, but they have expressed concerns about funding challenges and cultural resistance. To fully implement this recommendation, NASA will need to take action and provide documentary support for several of its identified planned next steps to enhance EVM surveillance. Without implementing proper surveillance, NASA may be utilizing unreliable EVM data in its analyses to inform its cost and schedule decision making.

High-Risk Area: [NASA Acquisition Management](#)

Director: William Russell, Contracting and National Security Acquisitions

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Orion Multi-Purpose Crew Vehicle: Action Needed to Improve Visibility into Cost, Schedule, and Capacity to Resolve Technical Challenges. GAO-16-620. Washington, D.C.: July 27, 2016.

Recommendation: To provide the Congress and NASA reliable estimates of program cost and schedule that are useful to support management and stakeholder decisions, the NASA Administrator should direct the Orion program to perform an updated Joint Cost and Schedule

Confidence Level analysis including updating cost and schedule estimates in adherence with cost and schedule estimating best practices.

Actions Needed: NASA partially agreed with this recommendation, stating that the agency reviewed, in detail, the Orion integrated cost/schedule and risk analysis methodology and determined the rigor to be a sufficient basis for the agency commitments. In November 2019, Orion program officials told us that in response to a recent policy change, the program office will update its joint confidence level analysis when the program has its Key Decision Point D review. This review occurs before the program enters the system assembly integration and test, and launch phase and is not scheduled to occur until December 2020. To fully implement this recommendation, NASA will need to provide evidence that it updated its joint confidence level analysis when the Orion program holds its Key Decision Point D review.

High-Risk Area: [NASA Acquisition Management](#)

Director: William Russell, Contracting and National Security Acquisitions

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[NASA Commercial Crew Program: Plan Needed to Ensure Uninterrupted Access to the International Space Station. GAO-18-476. Washington, D.C.: July 11, 2018.](#)

Recommendation: The NASA Administrator should develop and maintain a contingency plan for ensuring a presence on the International Space Station (ISS) until a Commercial Crew Program contractor is certified.

Actions Needed: NASA agreed with this recommendation. NASA stated that it is in discussions with Russia to obtain additional seats on its Soyuz spacecraft for NASA crew as a contingency plan. NASA is also providing Extra-Vehicular Activity and robotics training for a subset of cosmonauts to support U.S. Operating Segment operations, and looking at a possible extension of the duration of the Space X Demonstration 2 crewed test flight. In November 2019, NASA reported that it completed its actions for this recommendation. However, while NASA is working on potential solutions, there is no contingency plan in place. To fully implement this recommendation, NASA needs to provide documentation of its contingency plan.

High-Risk Area: [NASA Acquisition Management](#)

Director: William Russell, Contracting and National Security Acquisitions

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[NASA Human Space Exploration: Persistent Delays and Cost Growth Reinforce Concerns over Management of Programs. GAO-19-377. Washington, D.C.: June 19, 2019.](#)

Recommendation: We recommend the NASA Administrator ensure that the NASA Associate Administrator for Human Exploration and Operations direct the SLS program to calculate its development cost growth using a baseline that is appropriately adjusted for scope and costs NASA has determined are not associated with the first flight, and determine if the development cost growth has increased by 30 percent or more.

Actions Needed: NASA agreed with this recommendation. As of February 2020, NASA stated that it is conducting a rebaseline of the cost and schedule commitments for the SLS program and will document final decisions in an Agency Baseline Commitment decision memorandum. NASA officials anticipate they will complete this effort in Spring 2020. To fully implement this recommendation, NASA will need to measure cost growth using a baseline that reflects the scope of work currently planned for the first mission.

Recommendation: We recommend the NASA Administrator ensure that the NASA Associate Administrator for Human Exploration and Operations direct the Orion program to update its cost estimate to reflect its committed EM-2 baseline date of April 2023.

Actions Needed: NASA partially agreed with this recommendation, stating that providing the estimate to the forecasted launch date rather than to the committed baseline date of April 2023 is the most appropriate approach. In November 2019, program officials told us that they will consider this recommendation as part of updating the joint confidence level analysis for the program's Key Decision Point D review. This review occurs before the program enters the system assembly, integration and test, and launch phase, and is not scheduled to occur until December 2020. To fully implement this recommendation, NASA needs to provide an updated cost estimate through April 2023.

High-Risk Area: [NASA Acquisition Management](#)

Director: William Russell, Contracting and National Security Acquisitions

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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

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 and stated that the agency will provide a preliminary cost estimate for the Artemis III mission by the end of calendar year 2020. Further, NASA stated that it will provide an updated cost estimate for the Artemis III mission after it establishes cost and schedule commitments for some of the projects that compose the lunar mission, currently planned for Spring 2021. To fully implement this recommendation, NASA will need to provide a cost estimate.

High-Risk Area: [NASA Acquisition Management](#)

Director: William Russell, Contracting and National Security Acquisitions

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Ensuring Cybersecurity

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

Recommendation: The Administrator of the National Aeronautics and Space Administration (NASA) should take steps to review the assignment of the "000" code to any positions at NASA in the 2210 IT management occupational series, assign the appropriate National Initiative for Cybersecurity Education (NICE) framework work role codes, and assess the accuracy of position descriptions.

Action needed: NASA concurred with our recommendation and stated that it would complete a review of the assignment of the "000" code to its positions in the 2210 IT management occupational series, assign the appropriate NICE framework work role codes, and assess the accuracy of position descriptions. In March 2020, NASA indicated that it expected to implement the recommendation by September 30, 2020. To fully implement this recommendation, NASA will need to provide evidence that it has assigned appropriate NICE framework work role codes to its positions in the 2210 IT management occupational series and assessed the accuracy of position descriptions.

High-Risk area: [Ensuring the Cybersecurity of the Nation](#)

Director: Carol C. Harris

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Cybersecurity: Agencies Need to Fully Establish Risk Management Programs and Address Challenges, GAO-19-384. Washington, D.C.: July 25, 2019.

Recommendation: The Administrator of NASA should establish a process for conducting an organization-wide cybersecurity risk assessment.

Action needed: NASA concurred with this recommendation, and in January 2020, reported that it was in the process of documenting its process for an agency-wide cybersecurity risk assessment. The agency stated that it planned to complete this effort by September 30, 2020.

High-Risk area: [Ensuring the Cybersecurity of the Nation](#)

Director: Nick Marinos

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