

GAO@100 Highlights

Highlights of [GAO-21-330](#), a report to congressional committees

Why GAO Did This Study

In March 2019, the White House directed NASA to accelerate its plans for a lunar landing by 4 years, to 2024. Accomplishing this goal will require extensive coordination across lunar programs and contractors to ensure systems operate together seamlessly and safely. In December 2019, GAO found that NASA had begun making decisions related to requirements, cost, and schedule for individual lunar programs but was behind in taking these steps for the Artemis III mission.

The House Committee on Appropriations included a provision in 2018 for GAO to review NASA's proposed lunar-focused programs. This is the second such report. This report assesses the extent to which NASA has (1) made progress on its lunar programs, including for the 2024 lunar landing goal, and (2) addressed challenges related to its management of lunar programs.

GAO analyzed lunar mission and program documents and assessed the results of a 2020 NASA-sponsored study on lunar program status. GAO interviewed NASA officials on lunar program progress and risks and on plans to address study findings.

What GAO Recommends

GAO is making four recommendations, including that NASA assess off-ramps for an immature Gateway technology and document the process for determining key programmatic and technical tools for the Artemis missions. NASA concurred with three of the recommendations, but did not concur with the fourth, which related to the costs included in a lunar rover's cost estimate. GAO believes this recommendation remains valid.

View [GAO-21-330](#). For more information, contact W. William Russell at (202) 512-4841 or RussellW@gao.gov

May 2021

NASA LUNAR PROGRAMS

Significant Work Remains, Underscoring Challenges to Achieving Moon Landing in 2024

What GAO Found

The National Aeronautics and Space Administration (NASA) has initiated eight lunar programs since 2017 to help NASA achieve its goal of returning humans to the Moon. NASA plans to conduct this mission, known as Artemis III, in 2024. NASA has made progress by completing some early lunar program development activities including initial contract awards, but an ambitious schedule decreases the likelihood of NASA achieving its goal. For example, NASA's planned pace to develop a Human Landing System, shown below, is months faster than other spaceflight programs, and a lander is inherently more complex because it supports human spaceflight.

Notional Human Landing System



Source: National Aeronautics and Space Administration. | GAO-21-330

NASA also faces technical risks. For example, the Gateway—which NASA is developing to be an outpost orbiting the Moon—will rely on power and propulsion technology that has never before been used, and contractor efforts to develop the technology are behind schedule. NASA officials said they do not have a technology backup that would meet mission requirements. GAO best practices for technology assessments state that if a technology is not adequately mature, management should assess off-ramps at milestones. For this program, off-ramps would include potentially reducing the amount of power the system is required to provide to the Gateway or reassessing the schedule to allow for more time to develop the technology. NASA risks costly design changes or delays if the agency does not identify off-ramps before committing significant resources.

NASA has not fully addressed management challenges related to its lunar programs that were identified in a 2020 NASA-sponsored study. For example, GAO found that NASA assigned Artemis mission roles and responsibilities to specific divisions in response to a study finding; however, the agency has not clearly documented how it determined what key programmatic and technical tools it plans to use to guide mission decision-making. Without doing so, NASA cannot ensure that it has the appropriate processes in place to track how the missions will achieve objectives and address risks at the mission level.