

## Why GAO Did This Study

JWST is one of NASA's most expensive and technologically advanced science projects, intended to advance understanding of the origin of the universe. In 2011, JWST was rebaselined with a life cycle cost estimate of \$8.8 billion and a launch readiness date in October 2018—almost nine times the cost and more than a decade later than originally projected in 1999. Concern about the magnitude of JWST's cost increase and schedule delay and their effects on NASA's progress on other high-priority missions led conferees for the Consolidated and Further Continuing Appropriations Act, 2012, to direct GAO to report on the project. Specifically, GAO assessed (1) the extent to which NASA's revised cost and schedule estimates are reliable based on best practices, (2) the major risks and technological challenges JWST faces, and (3) the extent to which NASA has improved oversight of JWST. To do this, GAO compared NASA's revised cost and schedule estimates with best practice criteria, reviewed relevant contractor and NASA documents, and interviewed project and contractor officials.

## What GAO Recommends

GAO recommends NASA take six actions including, among others, to take steps to improve its cost estimate; to conduct an additional, earlier independent review of test and integration activities; and to develop a long-term oversight plan that anticipates planned travel budget reductions. In commenting on a draft of this report, NASA fully or partially concurred with the recommendations citing ongoing efforts, but GAO believes some do not go far enough.

View [GAO-13-4](#). For more information, contact Cristina Chaplain at (202) 512-4841 or [chaplainc@gao.gov](mailto:chaplainc@gao.gov).

# JAMES WEBB SPACE TELESCOPE

## Actions Needed to Improve Cost Estimate and Oversight of Test and Integration

### What GAO Found

The National Aeronautics and Space Administration (NASA) has provided significantly more time and money to the James Webb Space Telescope (JWST) than previously planned and expressed high confidence in the project's new baselines. Its current cost estimate reflects some features of best practices for developing reliable and credible estimates. For example, the estimate substantially meets one of four cost characteristics—comprehensive—that GAO looks for in a reliable cost estimate, in part because all life cycle costs were included. The estimate, however, only partially met the other three characteristics—well documented, accurate, and credible—which detracts from its reliability. For example, the estimate's accuracy, and therefore the confidence level assigned to the estimate, was lessened by the summary schedule used for the joint cost and schedule risk analysis because it did not provide enough detail to determine how risks were applied to critical project activities. The estimate's credibility was also lessened because officials did not perform a sensitivity analysis that would have identified key drivers of costs, such as workforce size. Program officials believe that it would have been difficult to fully address all best practice characteristics. GAO believes there is time to improve the estimate and enhance the prospects for delivering the project according to plan.

Project officials report that the JWST schedule has 14 months of reserve, which meets Goddard guidance for schedule reserve; however, only 7 of the 14 months are likely to be available for the last three of JWST's five complex integration and test efforts. GAO's prior work shows that the integration and test phases are where problems are commonly found and schedules tend to slip. Given that JWST has a challenging integration and test schedule, this could particularly be likely. The project has made some significant progress in the past year, notably successfully completing development of the 18 primary mirror segments—considered JWST's top technical risk. Nevertheless, ongoing challenges are indicative of the kinds of issues that can require significant effort to address. For example, instrument challenges have delayed the first integration and test effort. In addition, key long-term risks on subsystems with a significant amount of work remaining will not be retired until 2016. Currently, NASA's plan for project oversight calls for one independent mission-level system integration review about 13 months before launch. While this is consistent with what NASA requires for its projects, this approach may not be sufficient for a project as complex as JWST.

JWST has taken several steps to improve communications and oversight of the project and its contractors—such as taking over responsibility for mission systems engineering from the prime contractor; instituting meetings that include various levels of NASA, contractor, and subcontractor management; and implementing a new risk management system to allow for better tracking of risks. The enhancements to the oversight of the project are steps in the right direction, but it will take time to assess their effectiveness and ensure that the efforts are sustained by the project in the future. Reductions in travel budgets, however, could require the project to adjust the oversight approach that was adopted as a result of the replan. Additional reductions in travel budgets are anticipated in future years, but officials do not have a plan to address such reductions and their potential impact on continuing the current oversight approach.