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Highlights

Highlights of [GAO-09-844](#), a report to the Chairman, Committee on Science and Technology, House of Representatives

Why GAO Did This Study

NASA's Constellation program is developing the Ares I Crew Launch Vehicle and the Orion Crew Exploration Vehicle as the agency's first major efforts in a plan to return to the moon and eventually send humans to Mars. GAO has issued a number of reports and testimonies on various aspects of this program, and made several recommendations. GAO was asked to assess NASA's progress in implementing GAO's recommendations for the Ares I and Orion projects, and identify risks the program faces. GAO analyzed NASA plans and schedules, risk mitigation information, and contract performance data relative to knowledge-based acquisition practices identified in prior GAO reports, and interviewed government officials and contractors.

What GAO Recommends

GAO recommends that as NASA addresses the findings and recommendations of an ongoing review of U.S. human space flight being conducted per direction from the President, the new NASA Administrator direct the Constellation program, or its successor, to develop a sound business case before proceeding into its next phase. NASA concurred with our recommendation.

[View GAO-09-844 or key components.](#)
For more information, contact Cristina Chaplain at (202) 512-4841 or ChaplainC@gao.gov.

NASA

Constellation Program Cost and Schedule Will Remain Uncertain Until a Sound Business Case Is Established

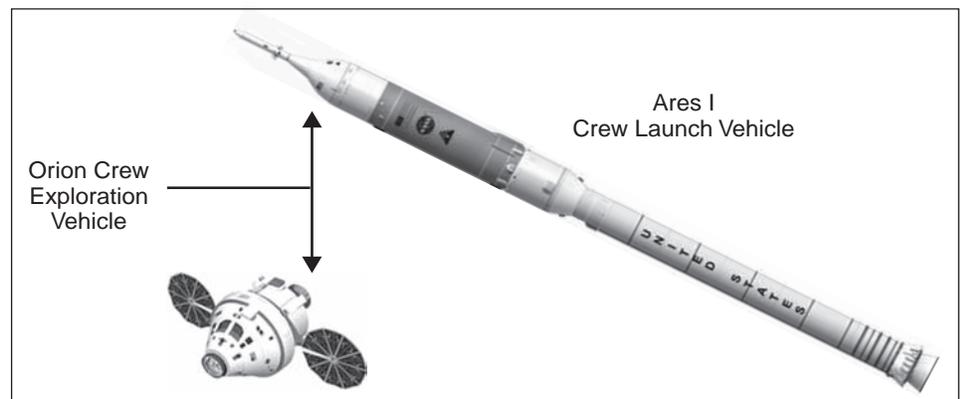
What GAO Found

NASA is still struggling to develop a solid business case—including firm requirements, mature technologies, a knowledge-based acquisition strategy, a realistic cost estimate, and sufficient funding and time—needed to justify moving the Constellation program forward into the implementation phase. Gaps in the business case include

- significant technical and design challenges for the Orion and Ares I vehicles, such as limiting vibration during launch, eliminating the risk of hitting the launch tower during lift off, and reducing the mass of the Orion vehicle, represent considerable hurdles that must be overcome in order to meet safety and performance requirements; and
- a poorly phased funding plan that runs the risk of funding shortfalls in fiscal years 2009 through 2012, resulting in planned work not being completed to support schedules and milestones. This approach has limited NASA's ability to mitigate technical risks early in development and precludes the orderly ramp up of workforce and developmental activities.

In response to these gaps, NASA delayed the date of its first crewed-flight and changed its acquisition strategy for the Orion project. NASA acknowledges that funding shortfalls reduce the agency's flexibility in resolving technical challenges. The program's risk management system warned of planned work not being completed to support schedules and milestones. Consequently, NASA is now focused on providing the capability to service the International Space Station and has deferred the capabilities needed for flights to the moon. Though these changes to the overarching requirements are likely to increase the confidence level associated with a March 2015 first crewed flight, these actions do not guarantee that the program will successfully meet that deadline. Nevertheless, NASA estimates that Ares I and Orion represent up to \$49 billion of the over \$97 billion estimated to be spent on the Constellation program through 2020. While the agency has already obligated more than \$10 billion in contracts, at this point NASA does not know how much Ares I and Orion will ultimately cost, and will not know until technical and design challenges have been addressed.

Artist's Rendition of Ares I and Orion



Source: GAO analysis and presentation of NASA photos and data.