NASA
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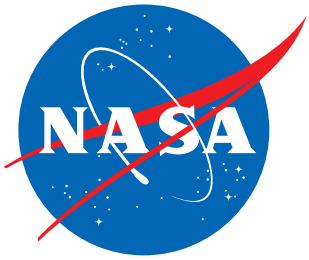
NASA's Management of Its Commercial Crew Program

June 30, 2026

IG-26-011



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RESULTS IN BRIEF

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IG-26-011 (A-24-15-00-HED)

WHY WE PERFORMED THIS AUDIT

For over 25 years, the International Space Station (ISS or Station) has served as an essential laboratory in low Earth orbit (LEO) for NASA, its international partners, and commercial industry to advance scientific research and prepare for deep space exploration. After the Space Shuttle's retirement in 2011, NASA relied solely on Russia's Soyuz spacecraft for crew transportation to and from the ISS until a safe and cost-effective U.S. option was available. During this time, NASA shifted its approach from owning and fully controlling crew vehicles to a commercial approach of advising and paying private companies to provide transportation services to and from the ISS through NASA's Commercial Crew Program (CCP). While NASA considers these partnerships successful, which helped share costs, CCP still requires significant taxpayer investment, NASA and commercial resources, and additional time to certify the vehicles for crewed missions.

In 2014, NASA awarded two fixed-price commercial crew transportation contracts to SpaceX for $2.6 billion and Boeing for $4.2 billion. The two contracts have increased in value to over $8 billion—primarily due to acquiring additional missions to support ISS crew operations through 2030—with several billion dollars more of NASA and commercial provider resources invested in the design, development, testing, and evaluation of the crew transportation capabilities. In 2020, SpaceX obtained human-rating certification for its Crew Dragon capsule and Falcon 9 launch vehicle—safely transporting crew to and from the ISS across 12 crewed missions to date. However, Boeing has been unable to obtain human-rating certification for its Starliner capsule and Atlas V launch vehicle, conducting two orbital flight tests and one crewed flight test that suffered significant issues and was ultimately classified as a serious mishap. With over 11 years invested and about 4 years of crewed operations aboard the ISS remaining until the Station's planned decommission in 2030, NASA and Boeing have limited time and resources to realize the value of their significant investments into Starliner.

In this audit, we examined NASA's management of CCP and the efforts of its two providers—SpaceX and Boeing—to achieve certification of their crew transportation capability and support continued crew transportation for ISS operations through 2030. To complete this work, we reviewed contract documentation, schedule data, and human-rating certification and operations documents. We also interviewed and collected data from both providers, as well as officials at Johnson Space Center, Kennedy Space Center, the White Sands Test Facility, and NASA Headquarters.

WHAT WE FOUND

While SpaceX ultimately worked through a variety of its own technical challenges and is currently providing continuous crew transportation to the ISS, Boeing's and NASA's development efforts to certify the Starliner continue to face challenges that have delayed progress and increased both costs and risks to sustained crew transportation to the ISS through 2030. Since 2020, Boeing's flight tests have uncovered numerous unexpected issues resulting in an additional 6 years of delays. These challenges culminated during the first crewed flight test of the Starliner, CFT, in June 2024. Many of these issues are related to three long-standing technical challenges that have prevented Boeing from obtaining the human-rating certification—helium leaks, propulsion systems failures, and parachute anomalies. The helium leaks and propulsion systems failures remain unresolved as of March 2026, and NASA is uncertain as to when this testing will be completed or human-rating certification for the Starliner will be obtained.

We found that three primary factors drove Starliner's ongoing technical challenges and associated schedule delays. First, NASA was overconfident in Boeing's design and potential success based on the provider's use of heritage systems and its long-standing space flight experience. Second, this overconfidence led to Boeing establishing and NASA accepting unrealistic launch and flight test schedules. Third, the pressure to adhere to this aggressive schedule was compounded by NASA's underutilization of the contract's data rights, limiting the Agency's ability to fully analyze and resolve flight simulation training failures to ensure crew safety. Going forward, NASA's ongoing workforce constraints may further hinder oversight, resolution of technical issues, and flight certification schedules.

The Agency currently lacks sufficient contracted flights to continue to fully crew the ISS through 2030, so additional flights will need to be purchased from either Boeing or SpaceX. As NASA and Boeing work to address these challenges and advance toward certifying Starliner in a safe manner, NASA announced the next flight—Starliner-1—will fly without crew. As a result of choosing to use this post-certification mission to fly cargo to the ISS, rather than transporting crew, NASA will incur additional costs. Further, NASA has already incurred $17 million in additional costs to accelerate SpaceX flights originally planned for the Starliner. NASA also authorized flights to proceed earlier than the contracts specified, which increased overall program costs and added financial risk to Boeing's contract. Therefore, we question $127.9 million in payments to Boeing, in addition to the $43 million we questioned in a prior 2019 CCP-related report, for a mission that is far from certain.

Lastly, we found NASA has significant requirements in place that inform its human space flight efforts, including classification of anomalies or accidents as either mishaps or close calls. Specifically, NASA requires a mishap classification if the main mission objectives are not achieved, with the most severe designation a Type A mishap, such as the Challenger and Columbia Space Shuttle disasters. Even though the CFT mission failed to return to Earth with crew—a key mission objective—NASA did not classify the CFT mission failures as a Type A mishap until February 2026—21 months after the mishap occurred. The Aerospace Safety Advisory Panel criticized the Agency's mishap reporting requirements, noting they create ambiguity, specifically for exemption of events from mishap classification if they occur during testing. The requirement, as written, resulted in ambiguity for NASA decision-makers when addressing the CFT failures, leading to delays, increased costs, and potential performance and safety issues on future flights.

WHAT WE RECOMMENDED

To increase transparency, accountability, and oversight of NASA's investments into CCP and its providers; minimize disruptions caused by Starliner schedule delays; ensure improper or significantly delayed space flight issue classifications are avoided; ensure continued crew safety; and address workforce reductions impacting CCP, we recommended NASA officials (1) as the contract allows, defer payments, including partial or advanced payments, to Boeing for any Starliner-3 milestones until the human-rating certification of Starliner is complete; (2) in coordination with Boeing, utilize the results of completed and ongoing investigations to develop a schedule to inform the dates of the next Starliner flight and future post-certification missions; (3) ensure the CFT issues and recommendations from the Program Investigation Team's investigation are resolved and documented in NASA's mishap information system and the Starliner flight manifest is updated to include the time necessary to complete these additional efforts; (4) establish a central process to ensure crew flight simulation testing results on hardware and software modifications are accessible to appropriate NASA officials; (5) ensure NASA requirements clearly establish that incidents meeting the criteria of a mishap or close call are classified as such, even when the events occur during testing; and (6) utilize NASA's work and workforce assessments to inform and prioritize hiring for critical skillsets needed to manage and oversee CCP operations in LEO through the ISS's decommissioning.

We provided a draft of this report to NASA management who concurred with all six of our recommendations and described planned actions to address them. We consider management's comments responsive; therefore, the recommendations are resolved and will be closed upon completion and verification of the proposed corrective actions.

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Acronyms

CCDev	Commercial Crew Development
CCiCap	Commercial Crew Integrated Capability
CCP	Commercial Crew Program
CCtCap	Commercial Crew Transportation Capability
CPC	Certification Products Contract
IFA	in-flight anomaly
ISS	International Space Station
LEO	low Earth orbit
OIG	Office of Inspector General

INTRODUCTION

For over 25 years, the International Space Station (ISS or Station) has served as an essential laboratory in low Earth orbit (LEO) for NASA, its international partners, and commercial industry to advance scientific research and prepare for deep space exploration.[1] To transport astronauts to and from the ISS, NASA first utilized the Space Shuttle, and beginning in 2006, it also used Roscosmos's Soyuz spacecraft.[2] Between 2006 and 2024, NASA purchased 68 Soyuz seats worth over $3.6 billion to ferry U.S. and partner astronauts to and from the Station. After the Space Shuttle's retirement in 2011, NASA relied solely on the Soyuz for crew transportation until a safe, reliable, and cost-effective U.S.-based transportation capability was available.

NASA shifted its approach after the Space Shuttle's retirement from owning and fully controlling crew vehicles to a commercial approach of advising and paying private companies to develop crew transportation capabilities to provide flights to and from the ISS as a service. Under NASA's Commercial Crew Program (CCP), the Agency issued a series of Space Act Agreements culminating in service-based contracts to provide crew transportation capabilities to meet ISS needs and increase the commercial market for space flight in LEO. In 2014, NASA awarded two fixed-price commercial crew transportation contracts to SpaceX for $2.6 billion and Boeing for $4.2 billion. Although NASA considers the partnerships successful, partly due to sharing costs with the commercial providers, CCP has nevertheless required a significant investment of taxpayer funds, NASA and commercial industry resources, and additional time for the vehicles to become certified for crewed missions. The two contracts have increased in value to over $8 billion in total—primarily due to acquiring additional missions to support ISS crew operations through 2030—with several billion dollars more of NASA and commercial provider resources invested in the design, development, testing, and evaluation of the crew transportation capabilities.

Despite these investments and the ultimate success of SpaceX's crew transportation capabilities, Boeing continues to face technical challenges and schedule delays. The two providers initially agreed to have crew transportation capabilities operating by 2017 following an uncrewed orbital flight test and a crewed flight test to obtain human-rating certification. As we previously reported, from 2017 through 2020, both providers experienced significant technical challenges with hardware and software.[3] In 2020, SpaceX obtained its human-rating certification for its Crew Dragon capsule and Falcon 9 launch vehicle—safely transporting crew to and from the ISS over 12 crewed missions to date. However, over the past 9 years, Boeing has been unable to obtain its human-rating certification for its Starliner capsule and Atlas V launch vehicle, conducting two orbital flight tests and one crewed flight test that suffered significant issues and was ultimately classified as a Type A mishap.[4] With over 11 years invested and

[1] LEO is the region in space from about 200 to 270 miles above the Earth's surface.

[2] The Space Shuttle Program flew missions from 1981 to 2011 and consisted of reusable shuttles that carried crew and cargo to the ISS and back to Earth. NASA contracted with Russia's space agency, Roscosmos, in 2006 to purchase seats on their Soyuz vehicle to transport crew to and from the ISS.

[3] NASA Office of Inspector General (OIG), *NASA's Management of Crew Transportation to the International Space Station* (IG-20-005, November 14, 2019).

[4] NASA's procedural requirements characterize a Type A mishap as the most serious type of mishap with significant costs associated with the event(s).

about 4 years of crewed operations aboard the ISS remaining until the Station's planned decommission in 2030, NASA and Boeing have limited time and resources to realize the value of their significant investments into Starliner.

In this audit, we examined NASA's management of CCP and the efforts of its two providers—SpaceX and Boeing—to achieve certification of their crew transportation capability and support continued crew transportation for ISS operations through 2030. See Appendix A for details of the audit's scope and methodology.

Background

The ISS is a continuously crewed microgravity research laboratory operating approximately 250 miles above Earth since November 2000. It supports international human space flight and scientific research and serves as a critical platform for NASA's LEO commercialization strategy and long-term exploration objectives, including missions to the Moon and Mars.[5] The Station is a key testbed for long-duration human space flight, with research focused on astronaut health and safety, as well as technology demonstrations required for future deep space missions. The ISS is managed by NASA in partnership with Russia's Roscosmos, the Canadian Space Agency, the European Space Agency, and the Japan Aerospace Exploration Agency, representing over two decades of international collaboration and hosting nearly 300 visitors to the Station from 26 countries. Although originally scheduled for retirement in 2015, the ISS has received multiple life extensions, most recently through 2030 with ongoing congressional hearings to extend operations through 2032. This would allow NASA to maintain a continuous presence in LEO aboard the ISS while simultaneously transitioning to commercially owned and operated destinations to ensure continuity of operations and research.

International Space Station Orbiting Above Earth

Source: NASA.

NASA's Commercial Crew Program

In 2005, Congress directed NASA to facilitate agreements with U.S. companies for research into and development of commercial crew and cargo space flight capabilities. In response, NASA created the Commercial Crew and Cargo Program office in 2005.[6] After the Space Shuttle's retirement in 2011, NASA relied solely on Roscosmos's Soyuz vehicle for crew transportation to and from the ISS until a safe, reliable, and cost-effective U.S.-based transportation capability was available. Following the establishment of CCP in 2011, NASA accelerated efforts to restore U.S. crew launch capabilities and

[5] NASA's commercialization LEO Microgravity Strategy focuses on several objectives: preserving and expanding research capabilities, advancing national and international space leadership, developing critical technologies for deep space exploration, and inspiring future generations through impactful space missions. By leveraging commercial and international partnerships, NASA aims to maintain its leadership in microgravity research and ensure continued benefits for humanity.

[6] The Commercial Crew and Cargo Program office was established in 2005. In 2011, a separate program office was established for just commercial crew, which is CCP.

made strategic investments into commercial partnerships to reduce its reliance on Roscosmos. CCP was established to manage crew transportation to the ISS and LEO.

To help manage and establish commercial crew capabilities, CCP utilized a five-phased procurement approach consisting of provider-led design and development. With this approach, NASA moved away from its more traditional management model for human space flight consisting of solely government oversight to a blend of NASA insight and oversight.[7] With such a significant and unique approach to acquiring human space flight services, CCP is structured, supported, and managed across multiple NASA centers and organizations. See Appendix B for additional details on CCP's role in NASA's commercialization of LEO, its phased procurement approach, and CCP's extensive collaboration efforts across multiple NASA and contractor locations.

The current and final phase of the five-phased approach is the Commercial Crew Transportation Capability (CCtCap) contracts. Under these contracts, two companies were selected to develop U.S.-based crew transportation capabilities that would be certified by NASA to meet human-rating requirements and begin routine flights to the ISS.

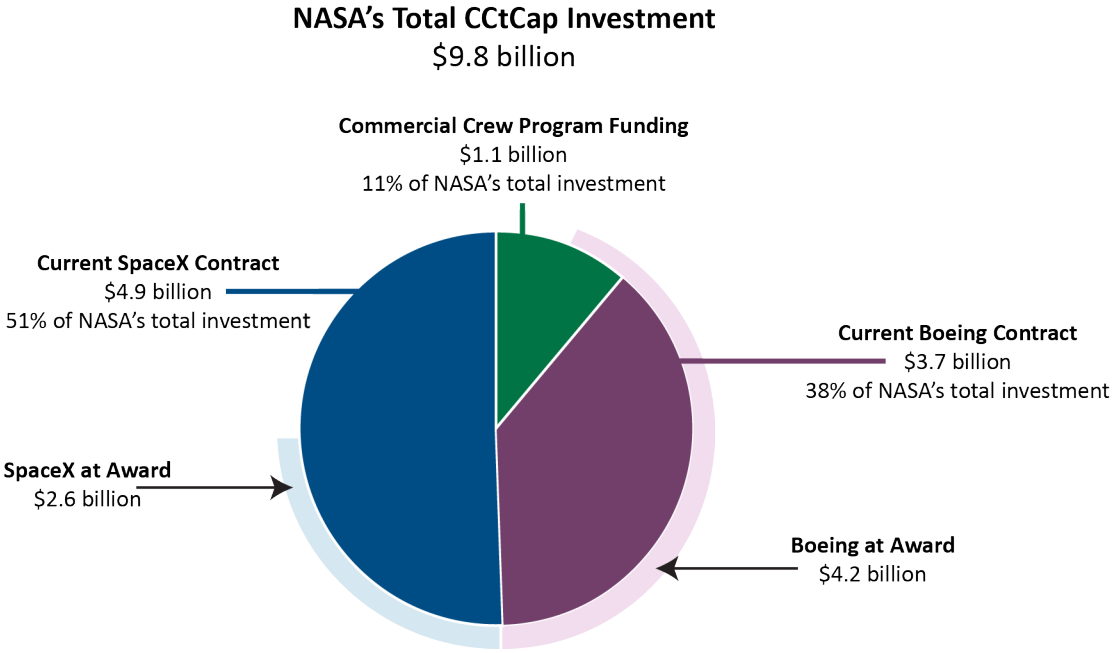
NASA's CCtCap Investment and Contract Approach

Since 2014, NASA has invested over $9.8 billion to successfully reestablish U.S.-based crew transportation services. As of April 2026, this includes approximately $8.7 billion for the CCtCap contracts and an additional $1.1 billion in related CCP funding. The contracts were initially awarded in 2014 to SpaceX for $2.6 billion and Boeing for $4.2 billion (see Figure 1). Each contract was awarded as firm-fixed-price, indefinite-delivery, indefinite-quantity over an initial 6-year period of performance.[8] They each include three contract line item numbers focused on (1) design, development, testing, and evaluation; (2) post-certification missions, which are generally routine crewed missions after the vehicle receives human-rating certification; and (3) special studies, which may include performing technical, cost, schedule, and risk assessments for potential new or changes to existing government-driven requirements.

[7] Insight is the government gaining an understanding of a contractor's activities and data with the goal of achieving final flight certification. Oversight is the government's formal review and documentation of either concurrence or nonconcurrence with a provider's products and activities.

[8] A firm-fixed-price contract provides a set price that does not change even if the contractor's costs increase during performance. An indefinite-delivery, indefinite-quantity contract refers to NASA's ability to issue an undefined number of task orders for services up to a specified amount of money.

Figure 1: NASA Planned versus Current Investment into CCtCap Efforts (as of April 2026)



Source: NASA Office of Inspector General (OIG) presentation of Agency data.

Note: "at Award" values are the maximum value of each contract at award in 2014. The current contract values are reflective of issued task orders including additional flights added to the contracts through April 2026. Dollar amounts in the figure are rounded, and as a result, the sums of those numbers may differ from total amounts.

Since the initial contract awards, NASA and the providers have negotiated modifications to the planned work, resulting in revised contract values. SpaceX's award has increased to $4.9 billion, primarily due to a 2022 contract modification to add eight additional post-certification missions to the ISS. In contrast, Boeing's contract value has decreased to $3.7 billion following a 2025 contract modification that removed two post-certification missions, reducing the potential number of total ordered Starliner flights from six to four. Aside from the post-certification mission changes, each contract has experienced lower cost growth overall compared to other firm-fixed-price space flight program contracts and cost-plus contracts.[9] Specifically, SpaceX's contract costs have grown approximately 11 percent, or $126.8 million, over initial estimates while Boeing's contract costs have grown approximately 14 percent, or $269.4 million, to meet additional NASA requirements for design, development, testing, and evaluation. Importantly, each provider has invested their own funding into the development of their vehicles, thereby significantly reducing NASA's investments.

[9] Cost-type contracts provide for payment of allowable costs up to an established ceiling that the contractor may exceed only with the approval of the contracting officer. According to the Aerospace Corporation, from 1999 to 2018, NASA's fixed-price contracts increased by an average of 33 percent. They also reported that during the same time period, the average cost growth under NASA's space flight cost-plus contracts was 49 percent. The Aerospace Corporation is an independent, nonprofit corporation that performs objective technical analyses and assessments for government, civil, and commercial customers.

NASA's additional investment of $1.1 billion includes activities such as the use of NASA testing facilities for propulsion systems, parachutes, and avionics testing; ongoing efforts by NASA toward certification of the providers' hardware and software systems; and certification of flight readiness for each flight. However, NASA subsequently determined this testing and certification work was beyond contract requirements and opted to fund this work separately from the contract.

Commercial Crew Program Management

CCP is managed within NASA's Space Operations Mission Directorate with staff primarily located at Kennedy Space Center, Johnson Space Center, and Marshall Space Flight Center. CCP receives support from other organizations and personnel across the Agency, including the ISS and Launch Services programs; NASA's three Technical Authorities (Office of Safety and Mission Assurance, Office of the Chief Engineer, and Office of the Chief Health and Medical Officer); multiple center leadership teams; and personnel with engineering expertise at the NASA Engineering and Safety Center.[10] NASA provides contract oversight and management, as well as access to its facilities and resources to support the CCP providers, including launch services, ground facilities, testing, engineering, and shared expertise. See Appendix B for additional information on CCP's collaboration efforts across the United States.

Insight and Oversight

The CCP public-private partnership model relies heavily on shared insight, shared assurance, and informed collaboration between NASA and its providers, while also applying some traditional oversight.[11] Essentially, insight is a monitoring activity whereas oversight is an exercise of authority by NASA. For insight, NASA can monitor provider progress in hardware and software development. For example, CCP has visibility into flight simulation training system issues, tracking, and reporting, but is limited in terms of requiring specific actions from the providers on how to address these issues. Based on CCP's approach, insight hinges on contract requirements, the contractor's insight implementation plans, and good communication between NASA and the providers, which NASA officials told us has seen marked improvement over the past few years.

For oversight, NASA took more direct actions to monitor progress and ensure mission success. Specifically, the Agency determined key milestones and requirements that required traditional oversight or deliverables that had to be reviewed and approved before development and certification could progress. Oversight, under the CCP approach, is primarily delivered through data requirements descriptions and other documentation and contractually established milestone reviews. However, given that key design decisions were made in phases prior to CCtCap, NASA continues to carry the risk of not identifying and mitigating all issues. Further, making design changes or adding requirements to the contracts during CCtCap increases the risk of adding significant costs.

[10] Historically, CCP had dedicated staff working directly with the Technical Authorities who looked across NASA's programs to help manage technical and safety risks. In addition, when necessary, technical expertise across the Agency was matrixed into CCP to help support design, development, testing, and evaluation efforts.

[11] NASA's Shared Assurance Model for Safety is a key component of the CCP public-private model. The shared assurance model allows NASA to shift more responsibility to the commercial providers while ensuring compliance with safety requirements.

Human-Rating Requirements and Certification

While SpaceX and Boeing own their respective vehicles, NASA shares responsibility for the overall safety of the missions and crew by ensuring the provider systems meet human-rating requirements. NASA policy outlines the processes and requirements beyond standard spacecraft system development to ensure spacecraft can accommodate human needs, potential safety risks, and crew recovery for hazardous situations.[12] The process for achieving a human-rated vehicle involves human safety risk identification, reduction, control, visibility, and program management acceptance criteria. As SpaceX's Crew Dragon and Boeing's Starliner were designed to carry astronauts and time-critical science, both vehicles are required to meet these human-rating certification requirements to routinely perform crewed post-certification missions to the ISS. Through a blend of insight and oversight, NASA has worked with both providers to help design and develop their respective spacecraft systems to meet the requirements. Ultimately, each provider was responsible for submitting and conducting sufficient tests and necessary documentation for NASA to review and verify. This contractual requirement is met through successful orbital and crewed flight test demonstration missions and data analyses. This certification must be maintained throughout the vehicles' and systems' lifetime.

Status of the Commercial Crew Providers' Crew Transportation Capabilities

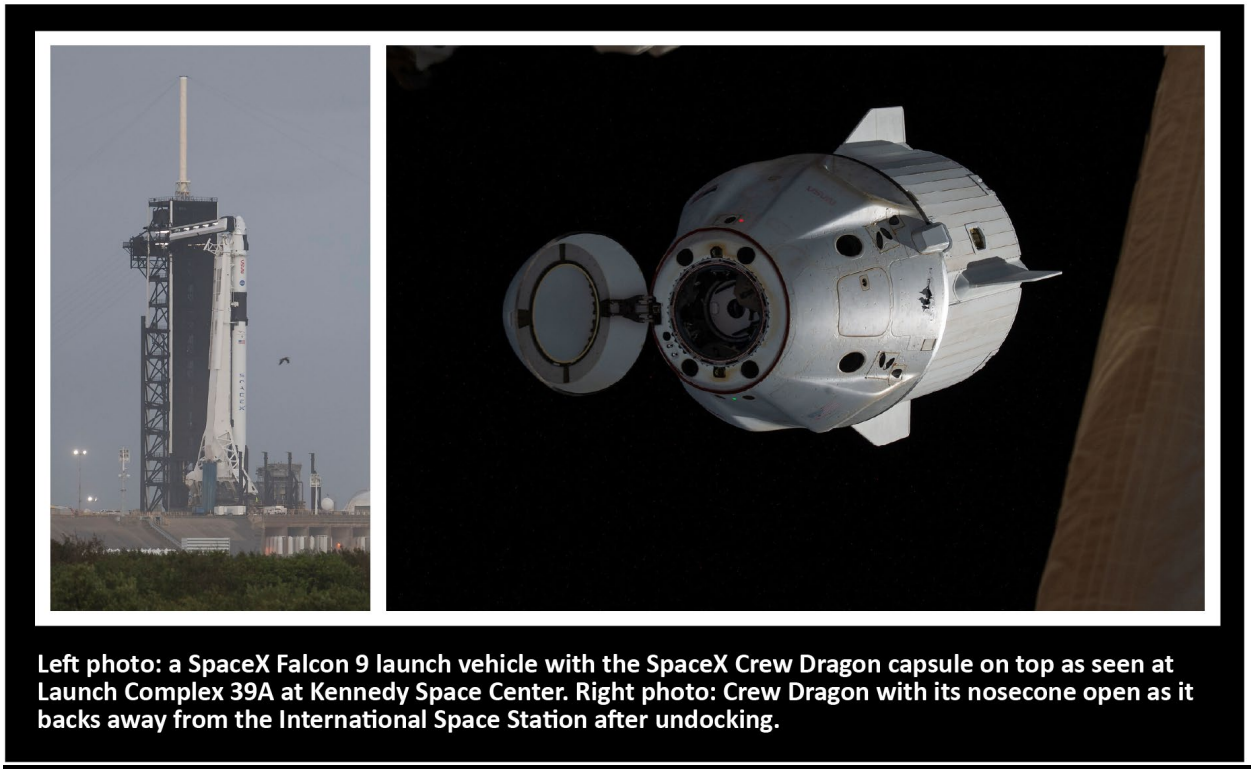
Initially, NASA and the providers agreed to complete their orbital and crewed flight tests, obtain human-rating certification for their vehicles, and have Crew Dragon and Starliner ready for post-certification missions by 2017. After multiple delays, the SpaceX Crew Dragon obtained its human-rating certification and is operating routine crewed flights, while the Boeing Starliner remains uncertified.

SpaceX Crew Dragon Is Certified and Operating Crewed Flights

The SpaceX Crew Dragon received human-rating certification in November 2020 prior to launching its first crewed post-certification mission, Crew-1, to the ISS. To obtain this certification, the Crew Dragon capsule and Falcon 9 launch vehicle underwent extensive testing, analysis, and review, including completing two demonstration missions—the uncrewed Demo-1 and crewed Demo-2 (see Figure 2). As issues arose, NASA and SpaceX jointly investigated the root causes and implemented corrective measures to mitigate crew safety risks. These joint efforts came at significant expense—in dollars and in investments of time, workforce, and facilities—to both NASA and SpaceX.

[12] NASA Procedural Requirements 8705.2C, *Human-Rating Requirements for Space Systems (Updated w/Change 2)* (July 10, 2017).

Figure 2: Photos of the SpaceX Falcon 9 Launch Vehicle and Crew Dragon Capsule



Left photo: a SpaceX Falcon 9 launch vehicle with the SpaceX Crew Dragon capsule on top as seen at Launch Complex 39A at Kennedy Space Center. Right photo: Crew Dragon with its nosecone open as it backs away from the International Space Station after undocking.

Source: NASA.

According to NASA and SpaceX officials, SpaceX leveraged experience from its Cargo Dragon capsule and Falcon 9 launch vehicle operations under its Commercial Resupply Services contract to help validate Crew Dragon and Falcon 9 system and hardware designs.[13] Although SpaceX encountered delays and design challenges during the early years of CCP, the company benefited from utilizing NASA expertise, enabling it to satisfy all human-rating certification requirements. SpaceX continues to evolve its systems and operational approach, requiring NASA to verify that design changes do not violate or compromise the human-rating certification granted in 2020. In addition, SpaceX's changes to its crew transportation operations, including introduction of a new vehicle landing and recovery area and increased flight reuse for the Crew Dragon and Falcon 9, have required oversight and approval consistent with NASA's review of revised systems. According to NASA and SpaceX officials, Crew Dragon landings were relocated from the East Coast to a designated area in the Pacific Ocean off the West Coast to reduce the risk of debris impact during Dragon return trips into populated areas.[14]

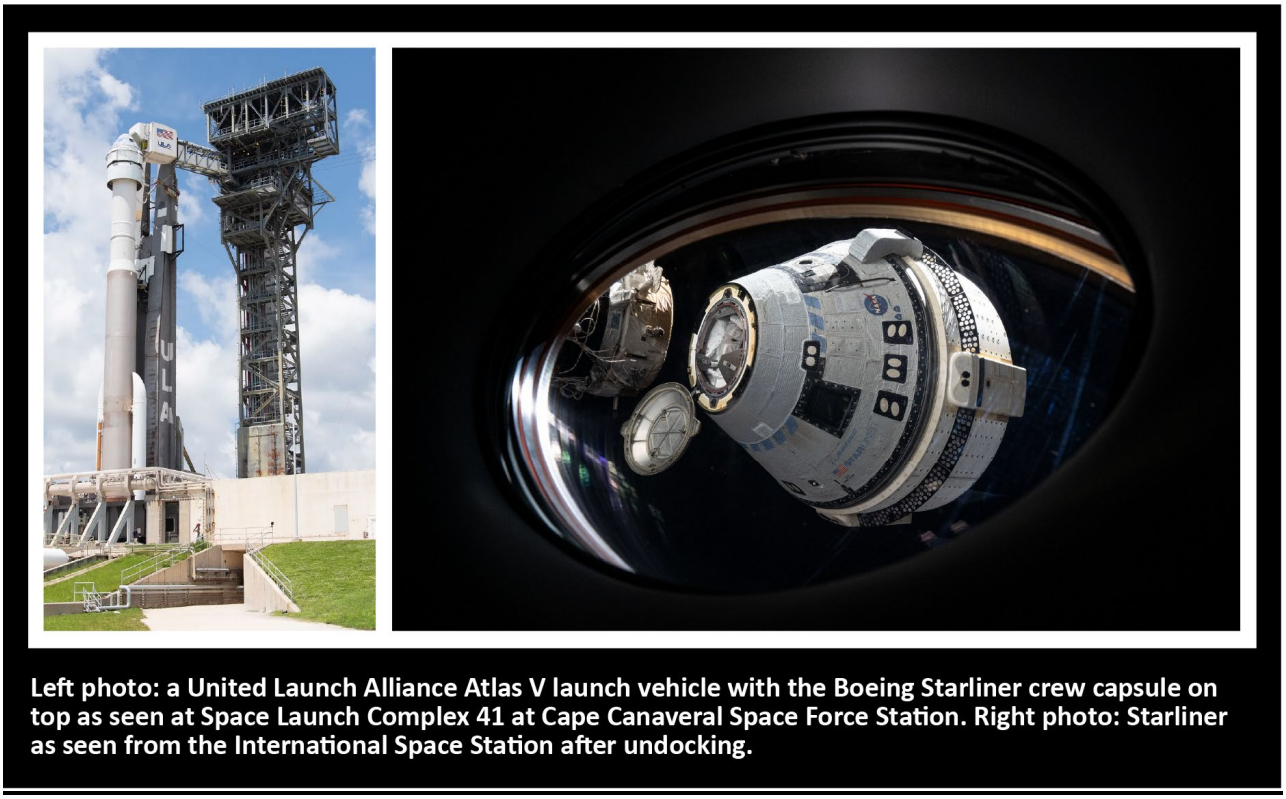
[13] NASA's Commercial Resupply Services contracts enable commercial industry to build, own, and operate space systems with the Agency purchasing services for its ISS operations and maintenance, along with its science and research needs. SpaceX was awarded a Commercial Resupply Services contract in December 2008 and has maintained continuous cargo delivery services to the ISS since 2012.

[14] During reentry a portion of the Crew Dragon engine "trunk" is jettisoned, which is supposed to burn up in the atmosphere. However, NASA and SpaceX discovered that some debris does not always burn up and has made an impact on Earth. The West Coast landing area is far less populated.

Boeing Starliner Has Completed Three Flight Tests but Remains Uncertified

Boeing launched its first uncrewed orbital flight test of the Starliner vehicle, OFT-1, from atop a United Launch Alliance Atlas V launch vehicle in December 2019 (see Figure 3).[15] During this mission, Starliner failed to reach the ISS due to a software-related timing error that made the spacecraft unable to successfully dock with the Station.[16] As a result, Boeing, at its own expense, investigated and resolved the issues that resulted in a failed OFT-1 flight and docking. Boeing then launched its second uncrewed orbital flight test of the Starliner, OFT-2, two and a half years later in May 2022. In this mission the vehicle successfully docked with the ISS but still had some issues.[17] Over 2 years later, the first crewed flight test of the Starliner, CFT, was launched in June 2024 with two astronauts on board and expected to last for 8 days. During this mission the vehicle docked with the ISS after having multiple technical issues. In an effort to mitigate the risk to the crew resulting from these issues, NASA elected to have them stay on the ISS until March 2025 while the vehicle returned uncrewed in September 2024.

Figure 3: Photos of the United Launch Alliance Atlas V Launch Vehicle and Boeing Starliner Crew Capsule



Left photo: a United Launch Alliance Atlas V launch vehicle with the Boeing Starliner crew capsule on top as seen at Space Launch Complex 41 at Cape Canaveral Space Force Station. Right photo: Starliner as seen from the International Space Station after undocking.

Source: NASA.

[15] The Boeing Starliner vehicle is designed and developed by Boeing with multiple subcontractors. For example, Boeing subcontracted with United Launch Alliance to use their Atlas V as the launch vehicle for Starliner's service and crew modules.

[16] The software-timing error was identified as an in-flight anomaly caused by insufficient testing and resulted in an incorrect orbit insertion burn when attempting to dock with the ISS.

[17] Issues identified under OFT-2 included service and crew module thruster failures and service module helium leaks.

Prior NASA Office of Inspector General Audit Reports and Other Oversight

We have issued three audit reports related to CCP since 2016, which focused on NASA's and the providers' ongoing challenges to obtain human-rating certification. In September 2016, we reported on CCP's multiple challenges that delayed both Boeing's and SpaceX's first crewed post-certification missions.[18] For example, past funding shortfalls and technical challenges with the providers' spacecraft designs drove schedule slippages. In November 2019, we reported that Boeing and SpaceX were having significant safety and technical challenges with parachutes, propulsion systems, and launch abort systems that needed to be resolved prior to receiving NASA authorization to transport crew to the ISS.[19] In September 2024, we reported on the propulsion systems failures that occurred during the June 2024 Boeing Starliner crewed flight test that could impact crew transportation to maintain and operate the ISS.[20]

Further, in our annual top management and performance challenges report, we reported in January 2026 that CCP is critical to sustaining a human presence in LEO.[21] We found that NASA is challenged with its limited redundancy and transportation capabilities to deliver crew, cargo, and scientific payloads to and from the ISS, making the Agency reliant on its commercial crew and cargo partners and Roscosmos while it works to maximize the Station's remaining life and value. Following the ISS's retirement, NASA plans to maintain a continuous presence in LEO through commercially owned and operated destinations. The transition from the ISS to a commercial destination will require significant investment from both NASA and industry and sufficient demand for services to support future research and exploration missions. This is inclusive of transportation capabilities like those developed under CCP.

The Aerospace Safety Advisory Panel routinely evaluates NASA's overall safety performance and advises the Agency on ways to improve that performance. The panel has reported on CCP's decision-making processes, risk management choices, and the benefit of having a reliable second provider. Specifically, the panel has strongly encouraged NASA to establish clear contractual and programmatic direction on the roles and responsibilities within CCP, including the structure and use of Mission Management Teams for resolution of unexpected events or anomalies that could affect crew safety.[22]

[18] NASA OIG, *NASA's Commercial Crew Program: Update on Development and Certification Efforts* (IG-16-028, September 1, 2016).

[19] IG-20-005.

[20] NASA OIG, *NASA's Management of Risks to Sustaining ISS Operations through 2030* (IG-24-020, September 26, 2024).

[21] NASA OIG, *2025 Report on NASA's Top Management and Performance Challenges* (TMC-2025, January 2026).

[22] Aerospace Safety Advisory Panel, *Annual Report for 2024* (January 25, 2025).

BOEING STARLINER DEVELOPMENT CHALLENGES DELAYING CERTIFICATION AND INCREASING THE COSTS AND RISKS TO CONTINUED CREW TRANSPORTATION TO THE ISS THROUGH 2030

Boeing has yet to successfully conduct the flight tests necessary to achieve a human-rating certification for crewed flights to the ISS and certification will likely be delayed to 2027, just 3 years before the planned end of the ISS's operational life in 2030. Several long-standing technical challenges have delayed Starliner's human-rating certification, including helium leaks, propulsion systems failures, and parachute anomalies. These unresolved technical issues were driven by NASA's and Boeing's overconfidence in Boeing's use of heritage systems, an unachievable schedule, and limited flight simulation data. As a result of Boeing's certification delays, NASA incurred additional costs and faces increasing risks to ensuring crew transportation capabilities meet the Agency's operational plan for the ISS. Lastly, we found that ambiguity in NASA requirements and delays in the appropriate mishap classification hindered the resolution of CFT issues.

Long-Standing Development Challenges Delay Starliner Certification

While NASA initially planned for the Boeing Starliner to receive its human-rating certification and provide post-certification missions to the ISS by 2017, Boeing's first uncrewed orbital flight test did not occur until nearly 3 years later. Since 2020, Boeing's two uncrewed orbital flight tests, OFT-1 and OFT-2, and one crewed flight test, CFT, have uncovered a significant number of unexpected issues with varying levels of mission risk, known as in-flight anomalies (IFA) and flight observations, resulting in an additional 6 years of delays.[23]

Significant issues peaked during the first crewed flight test of the Starliner, CFT, in June 2024. During this mission, Agency officials extended the stay of NASA astronauts Barry "Butch" Wilmore and Sunita "Suni" Williams on the ISS to 286 days—from an intended mission of 8 days—due to several technical and performance failures during flight and docking to the ISS. After propellant system failures caused a temporary total loss of control of the Starliner, which led to—in NASA's assessment—a nearly catastrophic CFT mission, Boeing identified approximately 100 IFAs and flight observations. Many of these anomalies and observations were related to three long-standing technical challenges—helium

[23] An IFA is defined as an unexpected event that can reasonably be considered to pose success implications for the immediate mission or subsequent missions. An IFA can further be categorized as an integrated IFA (IFA-I), which is defined as an unexpected observation that poses increased risk to mission success or crew safety. Alternatively, a flight observation is defined as an event occurring during vehicle flight that is unusual or expected, but with no immediate mission risk. SpaceX did not categorize issues encountered in the same fashion, but for comparison its uncrewed flight test identified 49 issues, or tickets, that they investigated and took actions on prior to its crewed flight test.

leaks, propulsion systems failures, and parachute anomalies—that have prevented Boeing from obtaining the human-rating certification required to routinely perform crewed post-certification missions to the ISS.

Helium Leaks. The Starliner service module—which contains the propulsion system that is essential to space flight, docking, and undocking—experienced helium leaks prior to the launch of the CFT mission. During flight and throughout the mission, persistent and changing leaks occurred, increasing risks to the service module's propulsion system capability. According to tests conducted by NASA and Boeing, the likely cause was O-ring degradation from extended exposure to the propellant. Helium system issues have persisted across the other Starliner flight tests.

Propulsion Systems Failures. Both propulsion systems in the service module and crew module experienced failures during CFT. Specifically, five of the service module thrusters failed due to overheating from the thrusters' close proximity to each other and limited methods to control and remove heat buildup from thruster firing (see Figure 4 for the thrusters' location within a service module "doghouse"). As a result, Commander Wilmore was forced to take manual control of the vehicle because automated control lost *six degrees of freedom of control*, which is the ability to maneuver the spacecraft into the six different movements possible in three-dimensional space: forward/back, up/down, left/right, yaw, pitch, and roll directions. After approximately 1 hour and 14 minutes of troubleshooting, NASA recovered use of four of the five thrusters, reinstating the mission flight rule-mandated six degrees of freedom control. As a result, Commander Wilmore was able to return control of the Starliner to the automated system, which successfully docked the capsule to the ISS. This on-orbit loss of control was significant and could have jeopardized the CFT crew, the ISS crew, and other spacecraft in LEO. Service module thruster failures have occurred in every Starliner flight test—10 during OFT-1, 3 during OFT-2, and 5 during CFT.

NASA's Boeing Crew Flight Test Astronauts Butch Wilmore and Suni Williams

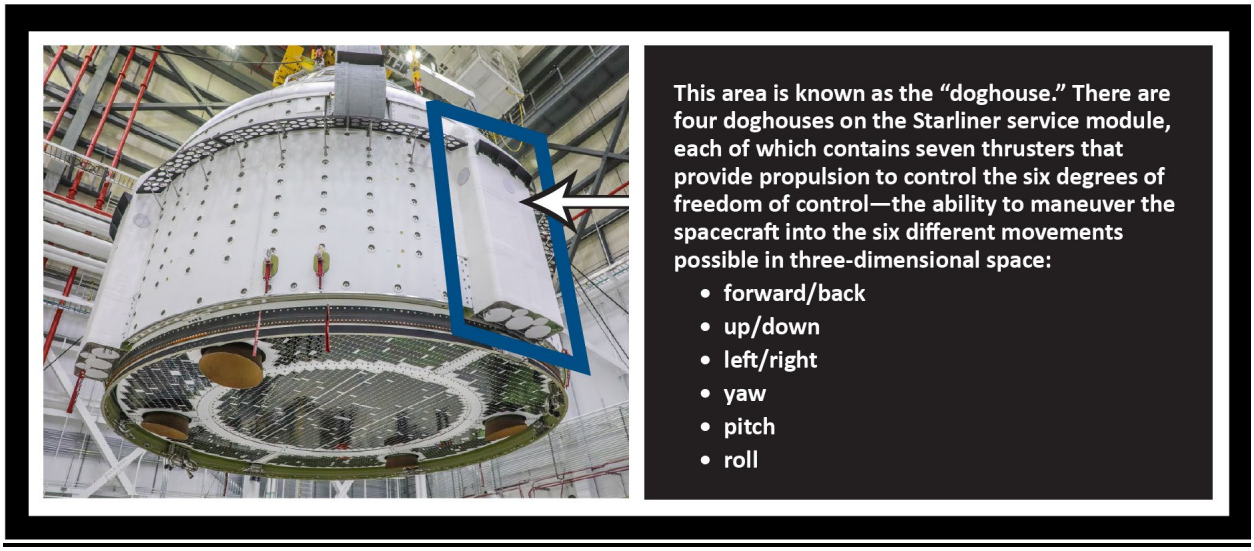
In this photograph, the crew poses inside of the vestibule between the ISS Harmony Module and the Boeing Starliner crew capsule. NASA astronauts Barry "Butch" Wilmore and Sunita "Suni" Williams launched to the ISS on June 5, 2024, from Space Launch Complex 41 at Cape Canaveral Space Force Station in Florida. During this mission, Agency officials extended the astronauts' stay on the ISS to 286 days—from an intended mission of 8 days—due to several technical and performance failures during flight and docking to the ISS.

To test in the space environment, the former NASA Administrator, along with senior NASA and Boeing officials, made the decision to keep the Starliner docked to the ISS. The Starliner remained docked for approximately 3 months to enable NASA and Boeing to conduct thruster firing and testing to collect additional data. Given the uncertainty of Starliner's service and crew module thruster performance, the astronauts could not return on the capsule. Instead, NASA transferred the CFT crew to the SpaceX Crew-9 Dragon mission that arrived on September 29, 2024. While on the Station, the CFT crew were integrated with the other two Crew-9 members to conduct science, research, and maintenance on the ISS. All four Crew-9 astronauts returned to Earth on March 18, 2025.

Source: NASA.

In addition, upon undocking from the ISS during CFT, within the crew module, one of the two thrusters failed, resulting in reliance on a single thruster for control of the vehicle during entry, descent, and landing. The investigation into the root cause of the crew module thruster failure during CFT is still ongoing.

Figure 4: Photo of the Doghouse on the Boeing Starliner Service Module



Source: NASA OIG presentation of Agency information and Boeing photo.

Parachute Anomalies. During CFT, several of the rings used to attach the parachute to the crew module were damaged, suffering varying degrees of bending. This issue also occurred during OFT-1 and OFT-2, as well as during parachute drop tests. Despite these anomalies, the parachutes performed within the specified performance requirements on CFT. Nonetheless, continued monitoring is ongoing to determine if any modification in the hardware or deployment of them is necessary.

As of March 2026, the helium leaks and propulsion systems failures remain unresolved, while parachute anomalies remain a risk that requires continued monitoring. Moving forward, in response to the Starliner CFT performance failures, NASA completed multiple investigations and continues to conduct others to further examine the Agency's certification process and determine why the anomalies that occurred during CFT were not detected and addressed earlier.[24] NASA and Boeing completed most of their investigations in late 2025, including ongoing testing at NASA's White Sands Test Facility.[25] In December 2025, they both concluded and formally announced the next flight and first post-certification mission, Starliner-1,

[24] Three NASA-led investigations concurrent to our audit were the (1) Starliner Tests and Anomalies Review whose team evaluated deficiencies in NASA's certification processes, including early design reviews for the propulsion systems, and identified lessons learned that could have prevented the CFT anomalies; (2) Starliner Data Review Team who examined real-time and post-flight data from OFT-1 and OFT-2 to determine why anomalies were not identified during earlier data reviews and defined improvements needed for evaluating CFT and Starliner-1 data; and (3) Program Investigation Team who conducted a deeper investigation, which according to CCP officials was analogous to a mishap investigation, into the decision-making process leading up to the CFT mission, including what NASA could have done differently to enhance crew safety. The Program Investigation Team includes representation from the Astronaut Office, and the investigation will result in several reports, with one overall report focused on the CFT mission and several other reports focused on specific technical issues like the helium leaks and propulsion systems failures. The overall report was released in redacted form by NASA in February 2026 in which the team recommended CFT be classified as a Type A mishap. As of March 2026, two of the technical investigations and their findings have been completed, with root causes not yet identified.

[25] After the CFT experienced issues with its propulsion systems, NASA and Boeing began multiple investigations to determine the root causes, including extensive thruster testing at the White Sands Test Facility, beginning in the summer of 2024, to address the propulsion systems failures. Testing included integrated firing of Starliner thrusters within a single service module doghouse—the term used to describe the four compartments on the service module exterior that each house seven thrusters. However, NASA and Boeing officials were unable to fully replicate the space environment and resulting thruster failures that occurred on the CFT flight. To test in the space environment, NASA and Boeing left the Starliner docked to the ISS for approximately 3 months to conduct thruster firing and testing to collect additional data.

would be flown uncrewed and transport cargo to prioritize crew safety. A Starliner-1 launch date is not currently scheduled, as NASA continues to evaluate launch opportunities. However, test results and analysis related to helium leaks and propulsion systems failures have not yet been completed as of March 2026, and NASA is uncertain as to when this testing will be completed or human-rating certification for the Starliner will be obtained.

Specifically, significant portions of the Program Investigation Team's investigation remain ongoing. Among other things, the team recommended that NASA conduct fully integrated testing to validate all modifications made to the Starliner to mitigate the risk of repeated helium leaks and propulsion systems failures. However, as NASA noted during the CFT mission, the only option for fully integrated hardware and software testing in the environment that the Starliner spacecraft will operate in—microgravity, low temperature, and the volume and vacuum of space—is in space.[26] As such, while the results of the investigations will incrementally move NASA and Boeing closer to Starliner's human-rating certification, several certification steps will continue to remain open that will not be achieved with Starliner-1 designated as a cargo, rather than a crewed, flight.

Starliner Challenges Driven by Heritage Systems, Schedule Pressure, and Limited Flight Simulation Data, with Workforce Issues Ahead

We found that three primary factors drove Starliner's ongoing technical challenges and associated schedule delays. First, NASA was overconfident in Boeing's design and potential success based on the provider's use of heritage systems and its long-standing space flight experience. Second, this overconfidence led to Boeing establishing, and NASA accepting, an unrealistic launch and flight test schedule.[27] Third, the pressure to adhere to this aggressive schedule was compounded by NASA's underutilization of the contract's data rights, limiting the Agency's ability to fully analyze and resolve flight simulation training failures to ensure crew safety. Going forward, NASA's ongoing workforce constraints may further hinder oversight, resolution of technical issues, and flight certification schedules.

[26] NASA and Boeing conducted extensive thruster testing campaigns at the White Sands Test Facility to address the propulsion systems failures but could not fully replicate the conditions experienced in space.

[27] According to NASA officials, schedule pressure exists with all early space flight system development. SpaceX experienced pressure to adhere to aggressive schedules for certification under Demo-1 and Demo-2. SpaceX overcame these challenges and has maintained an aggressive flight schedule since 2020.

Overconfidence in Boeing's Use of Heritage Systems Led to Underestimation of Integrated Testing

Overconfidence in heritage systems—previously flown space flight components—shaped CCP's five-phased procurement approach and limited flexibility in the design of the vehicles and their systems. As a result of this overconfidence in heritage systems, CCP did not require integrated testing for the CCtCap contracts, which only impacted Boeing, as SpaceX did not use heritage systems. Although the intent of each of CCP's five phases was to encourage commercial industry to create innovative design solutions, manufacturing processes, operational methods, and engineering techniques, many of the legacy capabilities of the industrial base laid the foundational framework for Boeing's spacecraft designs. To this end, NASA relied on existing frameworks and configurations, extensively trusting Boeing's previously tested hardware. Specifically, Boeing took advantage of heritage space flight systems and testing approaches, such as relying on established modeling and prior system mock-ups. Ultimately, both NASA and Boeing acknowledged they were overconfident in the company's use of heritage systems. NASA officials stated they should have required integrated testing to verify the flight hardware and software—much of which had been proven at the subsystem level—met required CCP performance specifications when fully integrated.

Strict Adherence to Unrealistic Launch Schedule Contributed to Performance Shortfalls

Several astronauts and CCP officials told us that unrealistic launch schedule dates, and an overemphasis on maintaining these dates, negatively impacted CCP and ISS operations. According to these officials, beginning in May 2021, CCP consistently operated as if Starliner's CFT mission was only 6 months away. The CFT astronauts and NASA officials acknowledged that more than 30 flight dates have been announced for the Starliner CFT flight over the past 5 years. This narrow focus led to internal control risks as well as several communication deficiencies across teams and stakeholders, including the astronauts, engineering officials, program managers, and the providers. Specifically, they reported multiple hardware and software systems, such as the doghouse, propulsion systems, and flight simulator testing, were impacted by unrealistic or aggressive launch dates. Several of the astronauts and CCP officials also noted that NASA did not appropriately address issues identified through flight simulations, like loss of crew, and design flaws, including the lack of a toilet aboard Starliner, because there was not sufficient time in the launch schedule.

NASA Lacked Sufficient Flight Simulator Training Data from Boeing

We found NASA lacked sufficient access to flight simulator training data and was therefore unable to make sure that simulation failures were fully analyzed and corrected to ensure crew safety.[28] Specifically, prior to the CFT mission, NASA's insight into simulator training records was limited by Boeing. However, the Agency did not apply the limited capabilities available within Boeing's contract to require additional testing or investigations when simulator training resulted in loss of crew or loss of vehicle. Even though Boeing owns and manages the simulation data, neither NASA nor Boeing had

[28] The Aerospace Safety Advisory Panel identified the importance of integrated testing for software systems to mitigate technical and safety risks in 2020. Software system testing is accomplished, in part, through flight simulator testing.

created a central process to track and resolve the simulation failures, resulting in NASA receiving inadequate insight into the data following any simulation failures. As such, in the case of CFT, its crew was not made aware of what caused the simulation failures, what actions were taken to resolve the issues, and when that work was completed. The CFT crew noted this was unlike the Shuttle era when simulation failures resulted in full and open investigations, with reporting to its crews. Instead, according to the CFT commander, there were multiple instances of loss of crew during flight simulations where CFT crew were not informed of any investigations into the failure or how the simulation data was used to improve flight hardware and software to ensure crew safety. In addition to an inadequate level of insight regarding simulation data, according to the CFT crew, there was an insufficient amount of simulation and software testing.

NASA Astronauts Butch Wilmore and Suni Williams in the Boeing Starliner Spacecraft Simulator at Johnson Space Center

Source: NASA.

NASA Faces Gaps in Its Workforce Potentially Reducing Oversight and Increasing Delays

Looking forward, NASA may be challenged to ensure adequate workforce levels for CCP and other key organizations to fully support the demands of the commercial crew transportation providers. Specifically, NASA's requirement to concurrently support and certify two providers has increased staffing demands and created corresponding challenges. Ongoing flight certification requirements for SpaceX, combined with Boeing's slow progress and persistent technical issues, have placed significant strain on NASA's workforce. In particular, NASA personnel work extensively with Boeing to investigate technical issues and develop corrective actions. Compounding the challenges to the already-thin workforce, as of April 2025, CCP lost approximately 21 percent of its workforce due to attrition and Agency reorganization.

Furthermore, reductions in NASA's workforce have occurred across several other key organizations that support commercial crew transportation, including the Space Operations Mission Directorate, ISS Program, Office of Safety and Mission Assurance, Office of the Chief Engineer, and Office of the Chief Health and Medical Officer. These organizations, along with CCP, collectively manage and approve the use of commercial vehicles to safely and reliably transport NASA and international partner crews to and from the ISS. CCP also relies on matrixed technical expertise from these offices to supplement its own staff. With shrinking Agency-wide staffing, CCP officials told us they are uncertain whether the program will continue to have access to these critical external resources, potentially limiting the Agency's oversight and the effectiveness of its insight.

In February 2026, the NASA Administrator announced a Workforce Directive to restore NASA's core competencies.[29] The directive identifies several key actions to identify and address deficiencies, including conducting work and workforce assessments and developing a plan to add targeted roles to the civil service. While it is too early to assess the success of this initiative, the directive better positions the Agency to assess the workforce needed to ensure safe and reliable crew transportation from its commercial providers.

Starliner Certification Delays Have Led to Increased Costs and Risks to NASA's Crew Transportation Capabilities

As a result of the continued delays to certify the Boeing Starliner, NASA will incur additional costs to fly Starliner-1 uncrewed. The Agency currently lacks sufficient CCtCap flights on contract to continue to fully crew the ISS until its decommissioned in 2030, so additional flights will need to be purchased from either Boeing or SpaceX. Further, NASA has incurred additional costs to accelerate the launch of flights from SpaceX originally planned for the Starliner. NASA's premature authorization to proceed with CCtCap flights before the contracts specified to do so also increased overall CCP costs and added financial risk to Boeing's contract.[30]

Certification Delays Continue into Starliner's First Post-Certification Mission

Ultimately, a successful uncrewed Starliner-1 mission will be the catalyst to Boeing obtaining the required human-rating certification.[31] While NASA officials have noted fall 2026 as the likely time frame for Starliner's certification, we found this to be unrealistic given the current delays for the Starliner-1 launch and lack of clarity on the progress this uncrewed cargo flight will accomplish on Starliner's certification plan. Furthermore, Boeing is facing additional scheduling constraints, including launch availability, docking port access on the ISS, and crew training timelines. As a result, the human-rating certification may be delayed to 2027, leaving a limited window of only being able to provide crewed flights to 2030, the planned end of the ISS's operational life.

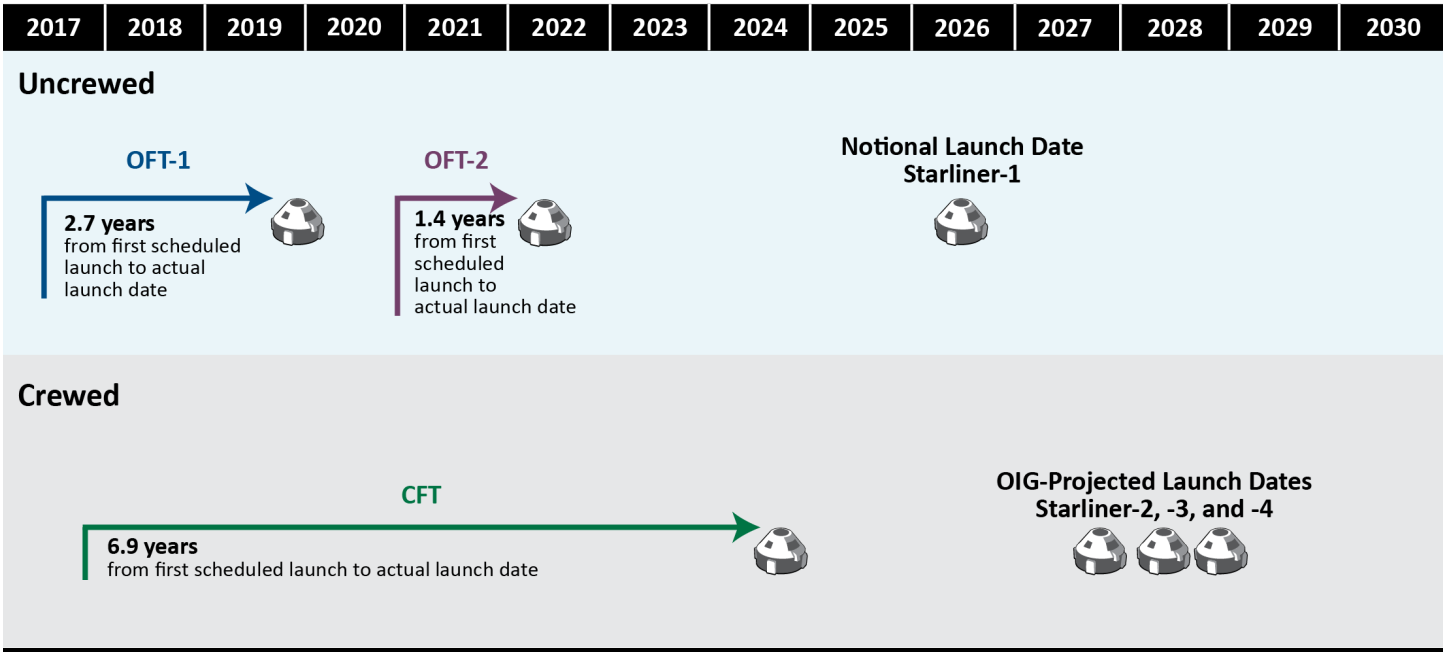
Due to Boeing's delays, in November 2025, NASA and Boeing mutually agreed to modify the CCtCap contract, reducing the number of post-certification missions from six to four. The modification also provides NASA with mechanisms to address potential schedule delays going forward. See Figure 5 for the planned timeline of Starliner orbital flight tests, the crewed flight test, and post-certification missions.

[29] NASA Administrator Jared Isaacman, *Workforce Directive: Restoring NASA's Core Competencies* (February 6, 2026).

[30] Authorization to proceed is an Agency action that effectively puts the flight on contract allowing the provider to begin billing NASA for achieved milestones. Unlike Boeing, financial risk for the additional SpaceX flight was not realized because SpaceX's flight had been completed.

[31] Starliner will not receive the human-rating certification until NASA and Boeing complete ongoing testing, address unresolved technical issues and requirements, complete the Certification Review, and prepare for a crewed Starliner-2 launch after the human-rating requirements are met. The Boeing Certification Review is a milestone to assess readiness and successful completion of criteria that NASA and the provider agreed upon earlier in the contract acquisition process. This review considers the provider's mission capabilities, performance independent of NASA, ascent aborts earlier than the prelaunch planned end-of-mission time frame, contingency of spacecraft crew support, and inability to dock with the ISS.

Figure 5: Planned Timeline for Starliner



Source: NASA OIG presentation of Agency information.

Note: Starliner-2, -3, and -4 are OIG projections to maintain continuous ISS crew and do not reflect actual launch dates or durations.

Designating Starliner-1 as a Cargo Flight Increases Costs to NASA

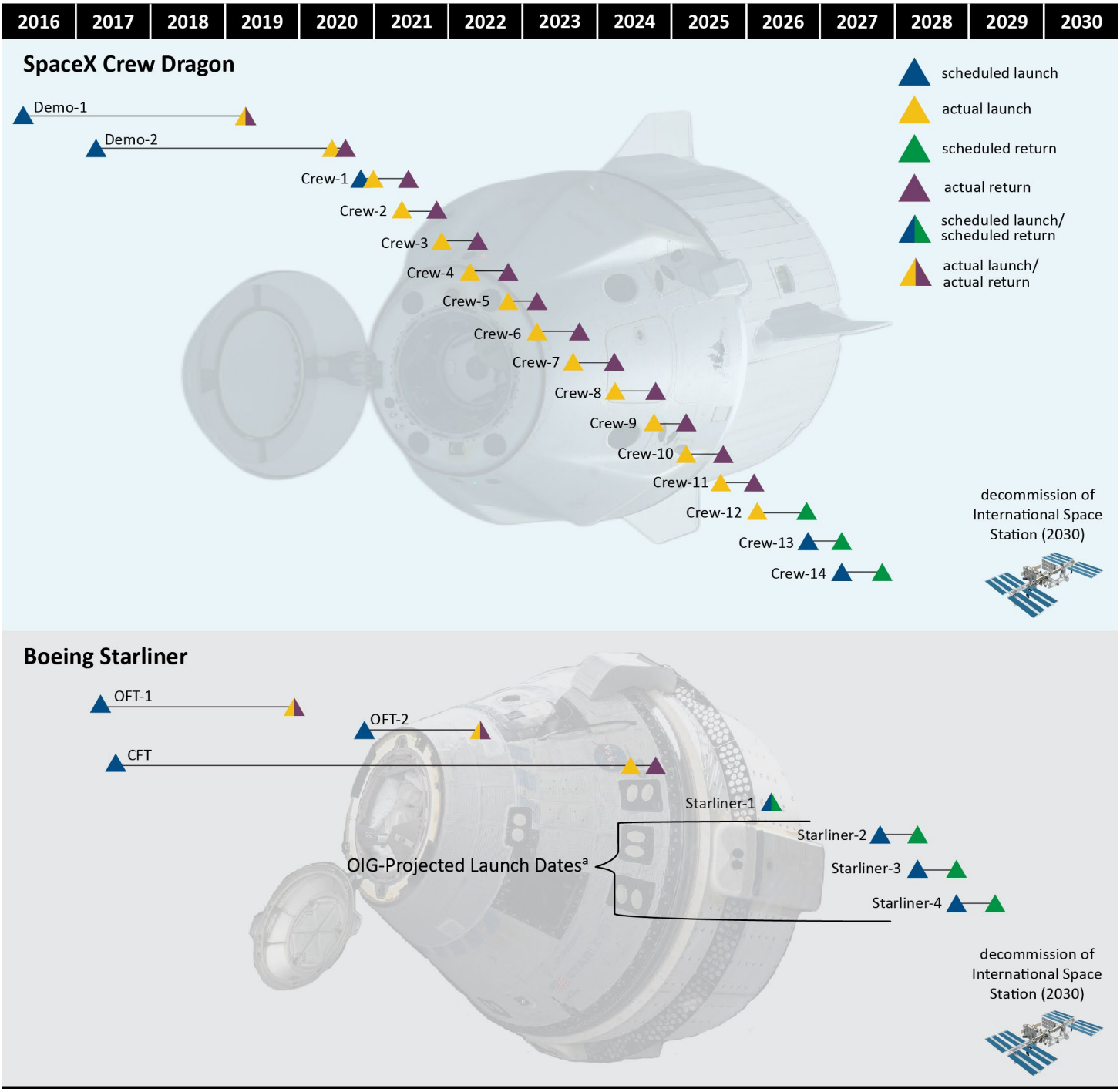
Given the uncertainty of what caused the CFT anomalies and whether Boeing's subsequent adjustments will mitigate or resolve the problems, NASA has decided to fly Starliner-1 as a cargo flight rather than a crewed flight at the Agency's expense. In this way, Starliner-1 will be able to validate the post-CFT modified and fully integrated systems' performance in the space environment prior to the crewed Starliner-2 mission without putting crew at risk. While we acknowledge and agree that testing and validating systems without risking crew safety is appropriate, using Starliner-1 as a cargo flight increases costs to NASA. Specifically, a cargo flight will not be able to fully test and evaluate key capabilities needed to achieve certification for crew transport—such as crewed undocking from the ISS and a safe crewed return to Earth. By using one of its contracted post-certification missions—valued at over $300 million—to allow Boeing to conduct what is effectively a third uncrewed orbital flight test, NASA will incur the cost of purchasing at least one additional post-certification mission for crew from either Boeing or SpaceX. This decision increases NASA's costs to maintain a crewed ISS, along with compounding the ongoing delays with certifying the Starliner and reducing the number of contracted crew flights NASA has under CCtCap.

Contracted Flights Will Not Support Current ISS Space Flight Needs through the Planned End of the Station's Operational Life in 2030

NASA needs to transport crew to and from the ISS approximately every 6 months through August 2030 to ensure a continued presence on the Station. Under the current Boeing CCtCap contract, NASA has procured four flights—if crewed, these four flights would provide 2 years of crew rotations to the ISS. Based on the current 6-month crew flight intervals planned for Boeing's post-certification missions, plus the three ongoing and future SpaceX missions on contract, NASA will have sufficient flights to keep the Station crewed into the spring of 2029. Given that the planned deorbit of the Station is likely to occur toward the end of 2030, NASA will need to procure at least three additional flights to crew the Station, including the replacement of Starliner-1, a post-certification mission that will not support a crew rotation to the ISS.[32] See Figure 6 for a chronological view of all CCP completed and planned orbital flight tests, crewed flight tests, and post-certification missions from SpaceX and Boeing.

[32] It is less expensive for NASA to continue with Boeing's two post-certification missions that could be crewed—Starliner-2 and Starliner-3—rather than contracting two new flights with SpaceX, because the Agency has already paid a large portion of those flight costs to Boeing.

Figure 6: Commercial Crew Program Flight Timeline



Source: NASA OIG presentation of Agency information.

Note: The only flights with "scheduled" launch dates are flight tests and planned future flights.

[a] Starliner -2, -3, and -4 are OIG projections to maintain continuous ISS crew and do not reflect actual launch dates.

NASA Paid $17 Million to SpaceX to Mitigate Continued Boeing Delays

NASA has incurred additional costs due to Boeing's continued delays in providing crewed flights to the ISS. Once SpaceX received its human-rating certification and began conducting routine crewed flights to the Station, NASA added 8 post-certification missions to SpaceX's CCtCap contract, for a total of 14 missions, to provide continued crew access to the Station. For flights originally assigned to Boeing that the provider could not fulfill due to the Starliner certification delays, NASA needed SpaceX to prepare two of its flights on an accelerated schedule relative to its contractually required 24-month launch lead time. As a result, NASA paid an additional $17 million in total to SpaceX for these two flights, accelerating the schedule, to ensure the Agency was able to maintain its nominal crew rotation schedule. NASA may have been able to avoid the additional costs of the accelerated flights had the Agency informed SpaceX to prepare its flights earlier. At the time, however, NASA was confident Boeing could meet its scheduled launch dates and thus delayed its decision to employ SpaceX flights. Given the continued delays with Starliner, SpaceX's contracted Crew-13 and Crew-14 missions will maintain crew transportation to the ISS through October 2027.

NASA's Advanced Payments to Boeing Increases the Agency's Financial Risks for Yet-to-Fly Missions

In November 2019, we reported that the Agency advanced payments on both CCtCap contracts to accelerate the providers' delivery of human-rated, reliable crew transportation and to instill confidence through NASA's commitment to the new commercial industry approach.[33] Specifically, in 2018, based on Boeing's delivery delays and NASA's overconfidence in the provider's use of heritage space flight systems, NASA added $287 million to Boeing's contract to help accelerate its readiness to fly crewed missions. That same year, NASA also authorized both Boeing and SpaceX to proceed with work on their third post-certification mission by modifying the guaranteed number of flights in their contracts, thereby committing funding years in advance of the third post-certification mission's launch. However, we found NASA's authorizations to proceed to be unnecessary and premature as neither provider had achieved a successful flight test at that time, which would have provided NASA with more reasonable assurance that the providers could execute three post-certification missions within the ISS's planned operational lifespan. As a result, in our 2019 report, we questioned $43 million of costs NASA paid to Boeing for Starliner-3 earlier than contractually required.

Similarly, based on Starliner's numerous technical challenges, we question whether Boeing will be able to fly three post-certification missions to the ISS before the planned end of the Station's operational life in 2030. As a result, since our prior audit in 2019, we question an additional $127.9 million NASA has spent since 2019 on milestone payments to Boeing for Starliner-3, a flight that is far from certain.[34] See Appendix C for more information on these questioned costs.

[33] IG-20-005.

[34] NASA included the Federal Acquisition Regulation default and performance-based payments clauses into both CCtCap contracts, allowing for "recovery of unliquidated performance-based payments" if NASA were to claim Boeing defaulted on the terms of the contract.

Ambiguity in NASA's Regulations Led to Delays in Appropriate Mishap Classification and Hindered Resolution of CFT Issues

Given the complexity and scale of the testing required following the CFT anomalies, combined with the ongoing schedule pressure, increased costs, and the risks to maintaining safe, routine crew transportation to the ISS, it is essential to comprehensively address the CFT issues. To this end, NASA has significant requirements in place that inform its human space flight efforts, including classification of anomalies or accidents as either mishaps or close calls.[35] As such, the CCtCap contracts contain explicit language on classifying such events. Further, NASA Procedural Requirements require a mishap classification if the main mission objectives are not achieved, with the most severe designation a Type A mishap, such as the Challenger and Columbia Space Shuttle disasters.[36] However, the Aerospace Safety Advisory Panel has criticized the Agency's requirements, specifically NASA Procedural Requirements 8621.1, as being ambiguous regarding mishap or close call classification requirements for events if the issue occurs during a flight test or other testing. The requirement, as written, resulted in ambiguity for NASA decision-makers when addressing the CFT failures, leading to delays and increased risks to crew safety.

A key objective of the CFT mission was to safely transport the astronauts to and from the ISS. However, the CFT commander lost automated maneuverability control prior to docking with the Station, and thus the mission failed to achieve one of its main objectives of returning the Starliner to Earth with crew. Nonetheless, NASA did not classify the CFT mission as a Type A mishap until February 2026—21 months after the mishap occurred.[37] Classification as a mishap is important because it allows NASA to formally document and track actions toward understanding and mitigating the significant issues, along with enforcing a timeline to complete a thorough investigation. This documentation and tracking occurs through NASA's mishap information system. Further, formal classification helps ensure proper identification, resolution, and lessons learned are collected and accessible for future application, a viewpoint also expressed by the Aerospace Safety Advisory Panel in their 2025 annual report.[38]

[35] NASA Procedural Requirements 8621.1D, *NASA Procedural Requirements for Mishap and Close Call Reporting, Investigating, and Recordkeeping (updated w/Change 4)* (July 6, 2020, which expires December 30, 2026), defines a NASA mishap as an unplanned event resulting in one of the following: (a) occupational injury or occupational illness to non-NASA personnel caused by NASA operations or NASA-funded research and development projects; (b) occupational injury or occupational illness to NASA personnel caused by NASA operations or NASA-funded research and development projects; (c) destruction of or damage to NASA property, public or private property, including foreign property, caused by NASA operations or NASA-funded research and development projects; or (d) NASA mission failure before the scheduled completion of the planned primary mission. A close call is defined as an event requiring first aid treatment or less, or property damage or mission failure with a direct cost of less than $20,000, based on a worst-case estimate by the responsible organization, but has NASA mishap potential.

[36] The Challenger crew of seven astronauts were lost in the explosion of their spacecraft during mission launch from Kennedy Space Center on January 28, 1986. While en route to landing at Kennedy Space Center on February 1, 2003, after a 16-day mission, Columbia and its crew of seven astronauts were lost during reentry over east Texas.

[37] In February 2026, the NASA Administrator issued a formal letter and released the Program Investigation Team's report findings that led the Agency to classify the CFT mission failures as a Type A mishap.

[38] The Aerospace Safety Advisory Panel, in their *Annual Report for 2025*, recommended the Agency needs to ensure clarity on the requirements for classification and resolution of mishaps.

In our judgment, the 21-month delay in failing to classify the CFT mission as a Type A mishap continues to delay resolution of Starliner issues that have persisted across three flight tests since 2019, further compounding costly delays in obtaining certification and limiting NASA's options for crew transportation. This delay in classification could lead to greater schedule delays, increased costs, and potential performance and safety issues on future flights.

CONCLUSION

After nearly a decade of relying solely on the Russian Soyuz for crew transportation to the ISS, U.S.-based space flight returned with SpaceX's Crew Dragon Demo-2 crewed flight test in 2020. Through CCP, NASA not only reestablished U.S. crew transportation capabilities but also moved away from owning and fully controlling crew vehicles. Instead, CCP established a commercial approach of advising and paying private companies to develop crew transportation capabilities and provide flights to and from the ISS as a service. Since 2014, NASA has made significant investments of over $9.8 billion into developing, testing, and certifying safe crew transportation capabilities to the Station.

While NASA and SpaceX have successfully completed 12 crewed missions to the ISS since 2020, Boeing has continued to face significant challenges and delays in obtaining Starliner's human-rating certification to conduct crewed flights. Certification will likely be delayed to 2027, just 3 years before the planned end of the ISS's operational life in 2030. Several long-standing technical challenges continue to delay Starliner's human-rating certification, including helium leaks, propulsion systems failures, and parachute anomalies. These unresolved technical issues were driven by NASA's and Boeing's overconfidence in the company's use of heritage systems, an unachievable schedule, and limited flight simulation data. These issues culminated in NASA moving forward with launching CFT despite known vehicle deficiencies that ultimately resulted in a failed mission and the extended stay of two astronauts on the ISS for almost 9 months. Moreover, because of Boeing's certification delays, NASA incurred additional costs and faces increasing risks to ensuring crew transportation capabilities meet the Agency's operational plan for the ISS.

To its credit, NASA has completed multiple investigations and continues to conduct others to further examine the Agency's certification process and determine why the anomalies that occurred during CFT were not detected and addressed earlier. Nonetheless, significant portions of the Agency's investigation remain ongoing, including a validation flight of Starliner to test the post-CFT modified and fully integrated systems' performance to work toward certification. In addition, NASA did not classify the CFT mission failures as a Type A mishap until 21 months after the mishap occurred, which continues to delay resolution of Starliner issues that have persisted across three flight tests since 2019, further compounding costly delays in obtaining certification and limiting NASA's options for crew transportation.

Looking forward, considering recent congressional direction requiring NASA to evaluate crew transportation needs to ensure robust U.S. access to commercial LEO destinations through 2040, sustained investment and effective management of CCP providers will remain critical. In the near term, given the continued challenges, we have concerns that all three of Boeing's authorized flights will not be flown by 2030 when NASA plans to decommission the Station. While NASA and Boeing work toward human-rating certification, this leaves NASA solely reliant on SpaceX for U.S.-based crew transportation to and from the ISS. Without a fully operational second provider, the Agency will be required to purchase additional flights to maintain a continuous presence on the Station. Additionally, without a second provider, NASA's ability to maintain a human presence in LEO is at risk should SpaceX encounter its own performance or operational challenges that impede its crew transportation capabilities.

RECOMMENDATIONS, MANAGEMENT'S RESPONSE, AND OUR EVALUATION

To increase transparency, accountability, and oversight of NASA's investments into CCP and its providers, we recommended the Associate Administrator for Space Operations Mission Directorate, in coordination with the Assistant Administrator for Procurement and CCP Manager:

1. As the contract allows, defer payments, including partial or advanced payments, to Boeing for any Starliner-3 milestones until the human-rating certification of Starliner is complete.

To minimize the disruptions caused by Starliner schedule delays and to ensure a continued focus on crew safety, we recommended the Associate Administrator for Space Operations Mission Directorate and CCP Manager, in coordination with the ISS Program Manager, Flight Operations Directorate Director, and Boeing officials:

2. Utilize the results of the recently completed and ongoing investigations to develop a schedule to inform the dates of the next Starliner flight and future post-certification missions.
3. Ensure the CFT issues and recommendations from the Program Investigation Team investigation are resolved and documented in NASA's mishap information system and update the Starliner flight manifest to include the time necessary to complete these additional efforts.
4. Work with Boeing to establish a central process to ensure crew flight simulation testing results on hardware and software modifications are accessible to appropriate NASA officials.

To help ensure improper or significantly delayed classifications for space flight-related issues are avoided, we recommended the Chief, Safety and Mission Assurance:

5. Ensure NASA Procedural Requirements 8621.1 clearly establishes that incidents that meet the criteria of a mishap or close call are classified as such, even when the events occur during testing of space flight systems or subsystems.

To help ensure continued crew safety and address workforce reductions impacting CCP management and insight capabilities, we recommended the Associate Administrator for Space Operations Mission Directorate, in coordination with the CCP Manager:

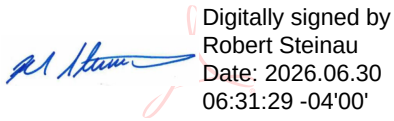
6. Utilize the work and workforce assessments conducted under the NASA Administrator's February 2026 Workforce Directive to inform and prioritize hiring for critical skillsets needed to manage and oversee CCP operations in LEO through the ISS's decommissioning.

We provided a draft of this report to NASA management who concurred with all six of our recommendations and described planned actions to address them. We consider management's comments responsive; therefore, the recommendations are resolved and will be closed upon completion and verification of the proposed corrective actions.

Management's comments are reproduced in Appendix D. Technical comments provided by management and revisions to address them have been incorporated as appropriate.

Major contributors to this report include Ridge Bowman, Human Exploration Audits Director; Susan Bachle, Deanna Lee, and Jamie Smith, Assistant Directors; Anna David; Thomas Dodd; Joel Rodriguez; Amy Bannister; Lauren Suls; and Makayla Gilliam.

If you have questions or wish to comment on the quality or usefulness of this report, contact Laurence Hawkins, Financial Oversight and Audit Quality Director, at 202-358-1543 or laurence.b.hawkins@nasa.gov.



Robert H. Steinau
NASA OIG Senior Official

APPENDIX A: SCOPE AND METHODOLOGY

While we performed this audit from November 2024 through April 2026, it was temporarily suspended during the government shutdown that occurred from October 1 to November 12, 2025. The audit was performed in accordance with generally accepted government auditing standards, which require that we plan and perform the audit to obtain sufficient, appropriate evidence to provide a reasonable basis for our findings and conclusions based on our audit objectives. We believe that the evidence obtained provides a reasonable basis for our findings and conclusions based on our audit objectives.

In this audit, we examined NASA's management of CCP. Specifically, we assessed (1) to what extent NASA is meeting its performance goal to secure U.S.-based crew access to the ISS through the Station's decommissioning, (2) what actions NASA and its providers are taking to achieve and sustain certified flight-ready vehicles, and (3) the extent to which Boeing is meeting cost and performance standards.

To assess the extent to which NASA is meeting its performance goal to secure U.S.-based crew access to the ISS through the Station's decommissioning, we examined ISS Program and CCP objectives, schedule goals, and review milestones to identify program planning, integration, and implementation. We examined internal launch schedules for crew transportation, LEO transition coordination and configurations, and ISS deorbit planning milestones.

We also examined CCP documents pertaining to the human-rating certification and operations for commercial crew transportation to the ISS. We interviewed and collected data from NASA officials at Johnson Space Center, Kennedy Space Center, the White Sands Test Facility, and NASA Headquarters. Specifically, we spoke with officials within the Space Operations Mission Directorate and its CCP office, including program management, ground and launch operations, systems, integration, spacecraft, safety, engineering, mission and mishap, and project planning and control; the Astronaut Office, including both astronauts on the Starliner CFT flight; the Office of Procurement; the White Sands Test Facility; and appropriate contracting officers, contracting officer representatives, and contractor officials for selected contracts and contractor sites. In addition, we met with and reviewed CCP-related documentation from the ISS Program office and the Agency's three Technical Authorities—the Office of the Chief Engineer, Office of Safety and Mission Assurance, and Office of the Chief Health and Medical Officer. In preparation for the audit, we conducted routine coordination with the Associate Counsel to the Inspector General and the Office of Inspector General's Office of Investigations.

To examine the extent to which NASA's two CCtCap contracts are meeting cost performance standards, we reviewed CCtCap government contract data, NASA review milestones, and contractor deliverables. We reviewed contract line item number modification logs and modifications in Boeing's and SpaceX's contracts to identify cost and scope changes, as well as Government Task Plans to determine the scope of work being provided to both providers. We also reviewed and analyzed CCP and contractor schedule data and cross-referenced this with overall ISS and CCP schedule goals to examine broader cost, schedule, and performance impacts to crew transportation capabilities in light of the continuing delays with certifying Boeing's Starliner.

In addition, the audit team, in coordination with the Office of Inspector General's Office of Data Analytics, obtained and analyzed financial data specific to overall commercial crew transportation efforts and CCtCap contract costs from NASA records. Specifically, CCP officials identified specific costs associated with the CCtCap contracts, as well as overall CCP costs. The audit team and Office of Data

Analytics used this information to calculate total costs for CCP under the CCtCap contracts and CCP efforts in support of the CCtCap contracts, Boeing, SpaceX, and other CCP costs to include testing and other resources used to mature the providers' systems and obtain human-rating certification. We also obtained Boeing public financial filings to calculate reportable costs for their Starliner efforts.

To determine what actions NASA and its providers are taking to achieve and sustain certified flight-ready vehicles, we reviewed NASA's certification approach. This approach is based both on shared accountability and assurance with the provider through the contract terms, CCP guidance for data requirements descriptions, verification and validation data, and the oversight and insight approach for the government's role in managing the contracts and obtaining human-rated transportation capabilities. Additionally, this included meeting technical standards for human-rating certification requirements (NASA Procedural Requirements 8705.2). We also reviewed over 5 years of insight planning documents from CCP to determine NASA's level of insight and oversight for both SpaceX and Boeing. Due to the issues encountered during the CFT flight, we reviewed the actions NASA took to ensure it was meeting standards for classification of mishaps or close calls as specified in NASA Procedural Requirements 8621.1. Additionally, we examined internal Aerospace Safety Advisory Panel briefings and analyzed internal flight observation data. Further, we spoke with officials and reviewed internal NASA investigations and White Sands Test Facility test results related to Starliner's identified issues for root causes and other systemic factors.

Assessment of Data Reliability

We used limited computer-processed data extracted from NASA's information technology systems during the course of this audit. We relied on the fact that data obtained and used has been tested through the Data Act reports. Additional assurance was obtained by reviewing the details of transactions falling within the audit scope as well as looking for obvious erroneous data. No discrepancies were noted. We determined that the data was sufficiently reliable for the purpose of reviewing cost data for points of analysis and discussion. From these efforts, we believe the information we obtained is sufficiently reliable for this report.

Review of Internal Controls

We assessed internal controls and compliance with requirements related to NASA's management of CCP. We also reviewed appropriate policies, procedures, and regulations and conducted interviews with responsible personnel. The control weaknesses we found were identified and discussed in this report. Our recommendations, if implemented, will improve the identified control weaknesses. However, because our review was limited to these internal control components and underlying principles, it may not have disclosed all internal control deficiencies that may have existed at the time of this audit.

Prior Coverage

During the last 10 years, the NASA Office of Inspector General and Government Accountability Office have issued seven reports of significant relevance to the subject of this report. Reports can be accessed at https://oig.nasa.gov/audits/ and https://www.gao.gov, respectively.

NASA Office of Inspector General

NASA's Management of Risks to Sustaining ISS Operations through 2030 (IG-24-020, September 26, 2024)

NASA's Management of the International Space Station and Efforts to Commercialize Low Earth Orbit (IG-22-005, November 30, 2021)

NASA's Management of Crew Transportation to the International Space Station (IG-20-005, November 14, 2019)

NASA's Efforts to "Rightsize" Its Workforce, Facilities, and Other Supporting Assets (IG-17-015, March 21, 2017)

NASA's Commercial Crew Program: Update on Development and Certification Efforts (IG-16-028, September 1, 2016)

Government Accountability Office

NASA Commercial Crew Program: Significant Work Remains to Begin Operational Missions to the Space Station (GAO-20-121, January 29, 2020)

NASA Commercial Crew Program: Schedule Uncertainty Persists for Start of Operational Missions to the International Space Station (GAO-19-504, June 20, 2019)

APPENDIX B: NASA'S COMMERCIAL CREW PROGRAM APPROACH, ORGANIZATION, AND MANAGEMENT

To provide additional context to NASA's commercial approach utilized under CCP, this appendix covers the program's role in commercial efforts in LEO, the procurement approach utilized by CCP, and the extensive collaboration efforts with NASA and contractor locations across the United States.

Commercial Crew Program's Role in NASA's Commercialization of LEO

Beginning in 2014, NASA made strategic investments and undertook efforts to transition its LEO infrastructure to the commercial space industry. CCP is a part of NASA's larger strategic goal of transitioning itself into a customer role for commercially provided services in LEO, such as crew and cargo transportation, space station destinations, and spacesuits. In December 2024, NASA published its updated LEO Microgravity Strategy recognizing the role the Agency has played in spurring the commercialization of LEO and advancing space technologies and capabilities through the Commercial Resupply Services Program and CCP.[39] To this end, NASA has made and continues to make significant investments to support commercial industry for ISS-related activities and research conducted in LEO, as well as for the broader commercialization of NASA's LEO activities.

Further, NASA established a public-private partnership approach to fund and support commercial industry to fill the gap in crew transportation after the retirement of the Space Shuttle in 2011. Under this approach, CCP works with commercial providers to design, develop, test, and evaluate crew transportation options for the ISS, and more recently, broader LEO space efforts including commercial space stations. This partnership model was established to give commercial providers maximum flexibility to create safe and cost-effective transportation systems and access to Agency technical expertise and resources. The model allows NASA to have a combination of insight and oversight into the provider's development process, rather than full oversight and management control as has traditionally been the case, in hopes of developing a balanced approach to achieve affordability, expediency, and efficiency in capability acquisition.

Commercial Crew Program Procurement Approach

To establish commercial capabilities, CCP has utilized a five-phased procurement approach consisting of provider-led design and development. Those five phases are (1) Commercial Crew Development

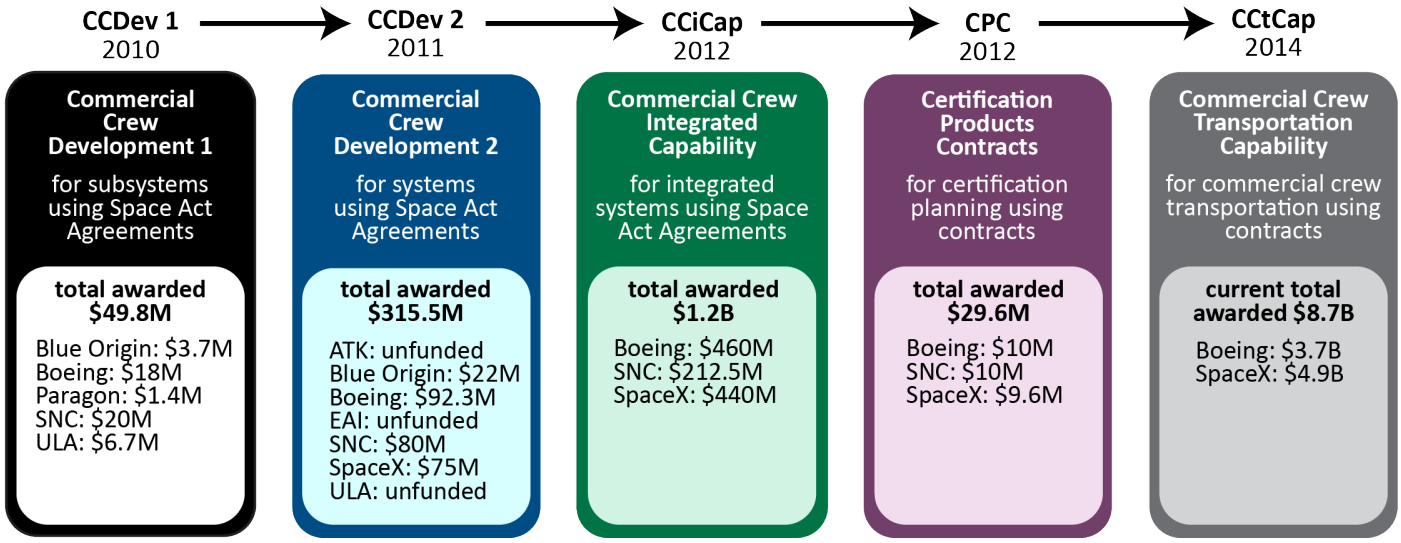
[39] NASA has established partnerships to provide commercial resupply services. Resupply missions ensure a U.S.-based capability to deliver scientific research and cargo to the ISS to increase NASA's ability to conduct new investigations and maintain ISS operations. The Commercial Resupply Services contracts are also a part of NASA's LEO commercialization efforts, enabling commercial industry to build, own, and operate space systems with the Agency purchasing services for its science and research needs.

(CCDev) 1, (2) CCDev 2, (3) Commercial Crew Integrated Capability (CCiCap), (4) Certification Products Contracts (CPC), and (5) Commercial Crew Transportation Capability (CCtCap). This phased approach was designed to enable NASA to work with commercial industry to solicit interest, collaborate on system designs, work through development, and achieve human-rating certification to begin providing safe, reliable crew transportation to the ISS.

The first three phases were funded under Space Act Agreements and established the providers' crew transportation designs.[40] Specifically, CCDev 1 and 2, the first and second phases, stimulated efforts within commercial industry to aid in the development and demonstration of safe, reliable, and cost-effective crew transportation capabilities, such as a spacecraft, launch vehicle, launch abort system, environmental control and life support system, and launch vehicle emergency detection system. Under CCiCap, the third phase, providers continued developing crew transportation capabilities and performed tests to verify, validate, and mature integrated designs.

CPC, the fourth phase, included contracts to three providers to develop certification plans toward achieving safe, crewed missions to the ISS. CCtCap, the fifth and final phase, includes two contracts with SpaceX and Boeing to continue certification plan efforts for commercially built and operated integrated crew transportation systems. Through its certification efforts, NASA will ensure selected commercial transportation systems meet the Agency's safety and performance requirements for transporting NASA and international partner crews to the Station. See Figure 7 for the evolution of these five phases and NASA's investment into each provider.

Figure 7: Evolution of the Commercial Crew Program's Five Phases to Obtain U.S.-Based Crew Transportation



Source: NASA OIG presentation of Agency information.

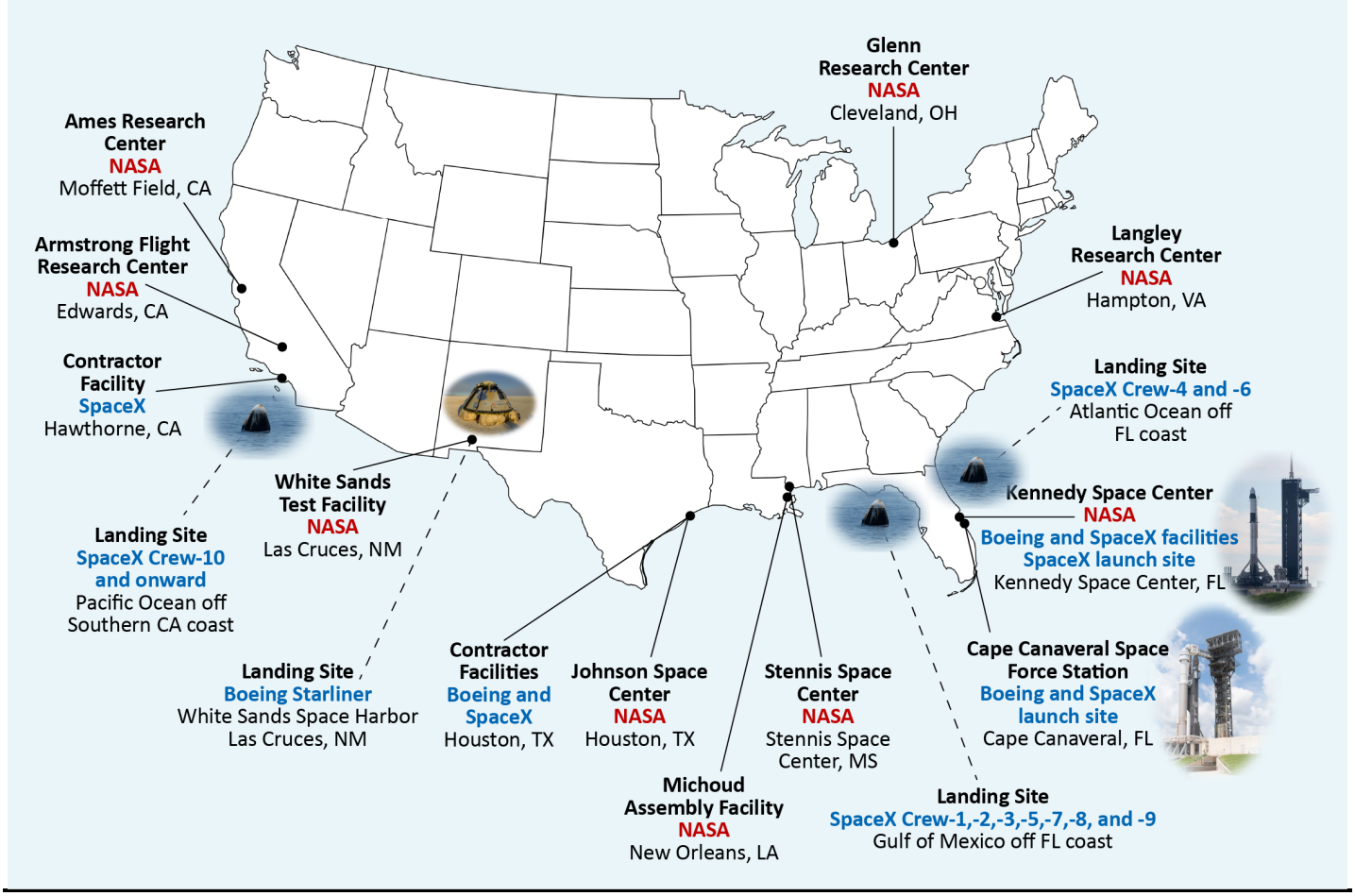
Note: Paragon Space Development Corporation (Paragon), Sierra Nevada Corporation (SNC), United Launch Alliance (ULA), Alliant Techsystems (ATK), and Excalibur Almaz Inc. (EAI). Dollar amounts in the figure are rounded, and as a result, the sums of those numbers may differ from total amounts. Additionally, the individual award values may not total to the total awarded due to additional funds being added to the contracts.

[40] A Space Act Agreement establishes a set of legally enforceable promises between NASA and a partner requiring a commitment of NASA resources, including goods, services, facilities, or equipment, to accomplish stated objectives.

Commercial Crew Program Collaboration Efforts

Since 2005, NASA has undertaken an extensive, multi-location collaboration effort to help the providers design and develop their respective spacecraft systems, which required support across multiple NASA centers and contractor sites. CCP operates through a nationwide public-private network of more than 1,000 suppliers, engaging all 50 states in support of crew transportation systems. Figure 8 identifies the key NASA centers and contractor locations used to test and operate CCP capabilities.

Figure 8: Map of NASA, Boeing, and SpaceX Facilities, and Launch and Landing Sites



Source: NASA OIG representation of Agency information.

APPENDIX C: QUESTIONED COSTS ON THE BOEING CCTCAP CONTRACT

We are questioning approximately $127.9 million in costs resulting from NASA unnecessarily starting and making payments for Boeing's third post-certification mission, Starliner-3, earlier than contractually required. These earlier-than-required payments were made despite NASA paying a substantial premium to Boeing already for the accelerated delivery of post-certification mission flights and increased mission flexibility to fly crewed missions as soon as possible. NASA unnecessarily authorized Starliner-3 to proceed with work and be eligible for milestone payments in November 2018 prior to any flight tests of the Starliner. The first flight test did not occur until December 2019. Section B.4, *Post-Certification Missions*, of Boeing's CCtCap contract requires at least 12 months of lead time between authorization to proceed and launch. As of March 2026, Boeing remained outside of the 12-months lead time required between authorization and launch of Starliner-3. Table 1 summarizes the questioned costs identified during our audit and discussed in this report, including the unnecessary milestone payments made to Boeing for Starliner-3 since 2019.

Table 1: Summary of Questioned Costs

Issue	Recommendation Number	Questioned Costs[a]
Unnecessary Milestone Payments for Starliner-3	1	$127,889,000
Total		**$127,889,000**

Source: NASA OIG analysis.

[a] Questioned costs are expenditures that are questioned by the OIG because of alleged violation of law, regulation, or contractual requirement governing the expenditure of funds; costs that are not supported by adequate documentation at the time of our audit; or are disallowed, unnecessary, or unreasonable.

APPENDIX D: MANAGEMENT'S COMMENTS

National Aeronautics and Space Administration

Mary W. Jackson NASA Headquarters
Washington, DC 20546-0001

Reply to Attn of: Space Operations Mission Directorate

TO: Deputy Assistant Inspector General for Audits

FROM: Acting Associate Administrator for Space Operations Mission Directorate
Acting Chief, Safety and Mission Assurance

SUBJECT: Agency Response to OIG Draft Report, "NASA's Management of Its Commercial Crew Program" (A-24-15-00-HED)

The National Aeronautics and Space Administration (NASA) appreciates the opportunity to review and comment on the Office of Inspector General (OIG) draft report entitled, "NASA's Management of Its Commercial Crew Program" (A-24-15-00-HED), dated May 15, 2026.

In this draft report, the OIG noted NASA has made significant investments in developing, testing, and certifying safe crew transportation capabilities to the International Space Station (ISS), as demonstrated by the success of SpaceX. However, the OIG found Boeing's Starliner program has experienced significant technical failures, certification delays, and cost growth undermining NASA's strategy for maintaining dual-provider redundancy. The OIG also found that overconfidence in heritage systems, unrealistic schedules, and insufficient testing contributed to a failed crewed test flight and prolonged astronaut stay, while delayed mishap classification further slowed corrective actions. As a result, NASA remains solely reliant on SpaceX for crewed transportation to ISS in the near term.

The OIG also questioned milestone payments made to Boeing for Starliner-3 between 2019 and 2021. NASA determined the questioned costs were allowable under, and consistent with, the terms and conditions of the Commercial Crew Transportation Capability (CCtCap) contract. The payments were associated with the completion of early Starliner-3 milestones, consistent with CCtCap. Based on estimated launch dates until 2021, these early milestones were required to ensure Starliner-3 would be on track for launch. As the test flights and milestones were delayed, NASA's payments were also delayed for Starliner-3 milestones.

The OIG makes six recommendations to NASA. Specifically, the OIG recommends the Associate Administrator for Space Operations Mission Directorate (SOMD) in coordination with the Assistant Administrator for Procurement and Commercial Crew Program (CCP) Manager:

Recommendation 1: As the contract allows, defer payments, including partial or advanced payments, to Boeing for any Starliner-3 milestones until the human-rating certification of Starliner is complete.

> **Management's Response:** NASA concurs with this recommendation. NASA is committed to implementing this recommendation to the extent it is consistent with the CCtCap contract terms and conditions. The next Starliner-3 milestone payment is not scheduled to occur until launch minus 1-year, which will occur after completion of the human-rating certification.
>
> **Estimated Completion Date:** Complete.

In addition, the OIG recommends the Associate Administrator for SOMD and CCP Manager, in coordination with the ISS Program Manager, Flight Operations Directorate Director, and Boeing officials:

Recommendation 2: Utilize the results of the recently completed and ongoing investigations to develop a schedule to inform the dates of the next Starliner flight and future post-certification missions.

> **Management's Response:** NASA concurs with this recommendation. NASA is committed to implementing the results of the investigations to inform the date of the first Starliner-1 flight and future post certification missions. NASA is actively implementing the investigation recommendations.
>
> The estimated date to complete actions for this recommendation is contingent upon final implementation of investigation recommendations prior to Starliner-1, which no launch date has been set.
>
> **Estimated Completion Date:** December 31, 2026.

Recommendation 3: Ensure the Crewed Flight Test (CFT) issues and recommendations from the Program Investigation Team (PIT) investigation are resolved and documented in NASA's mishap information system and update the Starliner flight manifest to include the time necessary to complete these additional efforts.

> **Management's Response:** NASA concurs with this recommendation. NASA is committed to resolving the CFT in-flight anomalies and implementing the applicable PIT recommendations. Action closures are being recorded in the NASA Mishap Information System (NMIS).
>
> The estimated date to complete actions for this recommendation is contingent upon final testing, data collection, and board closure.
>
> **Estimated Completion Date:** December 31, 2026.

Recommendation 4: Work with Boeing to establish a central process to ensure crew flight simulation testing results on hardware and software modifications are accessible to appropriate NASA officials.

> **Management's Response:** NASA concurs with this recommendation. Boeing has updated their system to log and resolve simulation issues leading up to CFT. NASA has determined the updated system adequately tracks testing results and is accessible to the appropriate NASA officials.
>
> **Estimated Completion Date:** Complete.

The OIG also recommends the Chief, Safety and Mission Assurance:

Recommendation 5: Ensure NASA Procedural Requirements (NPR) 8621.1 clearly establishes that incidents that meet the criteria of a mishap or close call are classified as such, even when the events occur during testing of space flight systems or subsystems.

> **Management's Response:** NASA concurs with this recommendation. The Office of Safety and Mission Assurance (OSMA) is in the process of revising NPR 8621.1 to improve clarity and ensure that the criteria for determining when an incident qualifies as a mishap or close call are clearly defined. OSMA remains committed to ensuring consistent application of NPR 8621.1.
>
> **Estimated Completion Date:** March 31, 2027.

Finally, the OIG recommends the Associate Administrator for SOMD in coordination with the CCP Manager:

Recommendation 6: Utilize the work and workforce assessments conducted under the NASA Administrator's February 2026 Workforce Directive to inform and prioritize hiring for critical skillsets needed to manage and oversee CCP operations in low Earth orbit (LEO) through the ISS's decommissioning.

> **Management's Response:** NASA concurs with this recommendation.
>
> SOMD and CCP are committed to ensuring critical skillsets are filled to successfully manage and oversee CCP operations. NASA is evaluating its organizational structure to maximize mission efficiency, streamline operations, ensure the most effective use of available budgets, and optimize the workforce. The effort focuses on supporting growth and development across the full range of LEO missions while maintaining flight safety.
>
> **Estimated Completion Date:** December 31, 2027.

We have reviewed the draft report for information that should not be publicly released. As a result of this review, we have not identified any information that should not be publicly released.

Once again, thank you for the opportunity to review and comment on the subject draft report. If you have any questions or require additional information regarding this response, please contact Michelle Bascoe at (202) 384-6027.

JOEL MONTALBANO
Digitally signed by JOEL MONTALBANO
Date: 2026.06.18 16:21:33 -04'00'

Joel Montalbano
Associate Administrator for
Space Operations (Acting)

Nathan Vassberg
Digitally signed by Nathan Vassberg
Date: 2026.06.22 08:28:02 -05'00'

Nathan Vassberg
Chief, Safety and Mission Assurance
(Acting)

cc:
Assistant Administrator for Procurement/Mr. Niese
Program Manager, Low Earth Orbit Program/Ms. Weigel
Lead, Commercial Crew/Ms. Hutcherson (Acting)
Director, Flight Operations Directorate/Mr. Knight

APPENDIX E: REPORT DISTRIBUTION

National Aeronautics and Space Administration

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Deputy Administrator
Associate Administrator and Chief Engineer
Chief of Staff
Acting Associate Administrator for Space Operations Mission Directorate
Assistant Administrator for Procurement
Chief Health and Medical Officer
Acting Chief, Safety and Mission Assurance
Commercial Crew Program Manager
International Space Station Program Manager
Director, Flight Operations Directorate
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Boeing

SpaceX

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    Subcommittee on Commerce, Justice, Science, and Related Agencies

Senate Committee on Commerce, Science, and Transportation
    Subcommittee on Aviation, Space, and Innovation
    Subcommittee on Science, Manufacturing, and Competitiveness

Senate Committee on Homeland Security and Governmental Affairs

House Committee on Appropriations
    Subcommittee on Commerce, Justice, Science, and Related Agencies

House Committee on Oversight and Government Reform
    Subcommittee on Government Operations

House Committee on Science, Space, and Technology
    Subcommittee on Investigations and Oversight
    Subcommittee on Research and Technology
    Subcommittee on Space and Aeronautics

(Assignment No. A-24-15-00-HED)