

**U.S. House of Representatives
Committee on Science, Space, and Technology
Subcommittee on Space**

The Commercial Crew Program: Challenges and Opportunities

CHARTER

Friday, February 27, 2015
9:00 a.m. – 10:30 a.m.
2318 Rayburn House Office Building

Purpose

At 9:00 a.m. on Friday, February 27, 2015 the Subcommittee on Space will hold a hearing titled *The Commercial Crew Program: Challenges and Opportunities*. The purpose of this hearing is to review NASA's efforts to develop and acquire safe, reliable, and affordable crew transfer services to the International Space Station (ISS). The Subcommittee will examine the progress of NASA's Commercial Crew Program, its acquisition model, and future challenges for the program as the contractors move towards certification.

Witnesses

- **Mr. Bill Gerstenmaier**, Associate Administrator, Human Exploration and Operations Mission Directorate, National Aeronautics and Space Administration (NASA)
- **Vice Admiral Joseph Dyer, USN (Ret.)**, Chairman, Aerospace Safety Advisory Panel, National Aeronautics and Space Administration (NASA)
- **Mr. John Mulholland**, Vice President and Program Manager, Commercial Programs, The Boeing Company
- **Dr. Garret Reisman**, Director, Crew Operations, Space Exploration Technologies Corporation

Background

The Commercial Crew Program (CCP) was proposed, in its current form, in February 2010 with President Obama's announcement to cancel the Constellation program and develop a system to ferry astronauts to and from the International Space Station.¹ Congress authorized this new paradigm with the passage of the NASA Authorization Act of 2010.² NASA announced on September 16, 2014, that it would continue into the final phases of development, and ultimately human-rating certification, with two contractors, the Boeing Company (Boeing) and Space Exploration Technologies Corporation (SpaceX).³ The third partner that was not chosen, Sierra Nevada Corporation, filed a protest with the Government Accountability Office (GAO) that the GAO denied on January 5, 2015 clearing the way for NASA to continue to fund the Boeing and SpaceX teams.⁴

¹ President's Budget Request for the National Aeronautics and Space Administration, Fiscal Year 2011 <http://www.nasa.gov/news/budget/2011.html>

² National Aeronautics and Space Administration Authorization Act of 2010, P.L. 111-267, Sec. 402.

³ Source Selection Statement for Commercial Crew Transportation Capability Contract (CCtCap), September 15, 2014 <http://www.nasa.gov/sites/default/files/files/CCtCap-Source-Selection-Statement-508.pdf>

⁴ Sierra Nevada Bid Protest Decision, January 5, 2015, <http://www.gao.gov/assets/670/667979.pdf>

Program Authorization

Commercial crew capabilities were initially authorized in the NASA Authorization Act of 2008. Section 902 of the 2008 Act directs NASA to “enable a commercial means of providing crew transfer and crew rescue services for the International Space Station.” To achieve this goal, the bill directs that NASA-

- 1) make use of United States commercially provided International Space Station crew transfer and crew rescue services to the maximum extent practicable;*
- 2) limit, to the maximum extent practicable, the use of the Crew Exploration Vehicle to missions carrying astronauts beyond low Earth orbit once commercial crew transfer and crew rescue services that meet safety requirements become operational; and*
- 3) facilitate, to the maximum extent practicable, the transfer of NASA-developed technologies to potential United States commercial crew transfer and rescue service providers, consistent with United States law.⁵*

This Act also expressed Congressional intent that prohibited the Administration from funding the Commercial Crew program at the expense of Exploration programs.⁶

The policies prescribed in the NASA Authorization Act of 2010 continued this direction and included additional reporting requirements with regard to the safety of the systems under development. The Act required the Administration, “to provide independent assurance of flight safety and flight readiness before the authorization of United States government personnel to participate as crew onboard any commercial launch vehicle developed...”⁷ Additionally, the Act directed the Administration to utilize the Orion crew vehicle as a backup should the Commercial Crew capabilities not fulfill the government’s needs.⁸

Program Structure and Schedule

In describing this program, the Administration often refers to a “commercial partnership” where private industry contributes funding in addition to NASA’s government funding. This is in contrast to a traditional development project whereby the contractor is paid for all work performed at the behest of the government and thereby the government owns additional rights to the work performed. NASA’s shift in acquisition strategy was accompanied by the increased use of a special procurement mechanism referred to as “Other Transaction Authority,” or OTA, for large developments. This authority was granted to NASA by the National Aeronautics and Space Act of 1958 (P.L. 85-568)⁹ and permits NASA to enter into a “Space Act Agreement” for many purposes, including technology development.

The agency contends that the use of Space Act Agreements permits more flexibility than traditional Federal Acquisition Regulations (FAR)-based development programs, specifically the ability of the government to share costs with industry partners. In NASA’s Commercial Cargo

⁵ National Aeronautics and Space Administration Authorization Act of 2008, P.L. 110-422, Sec. 902(a).

⁶ National Aeronautics and Space Administration Authorization Act of 2008, P.L. 110-422, Sec. 902(b).

⁷ National Aeronautics and Space Administration Authorization Act of 2010, P.L. 111-267, Sec. 403(b)(5).

⁸ National Aeronautics and Space Administration Authorization Act of 2010, P.L. 111-267, Sec. 303(b)(3)

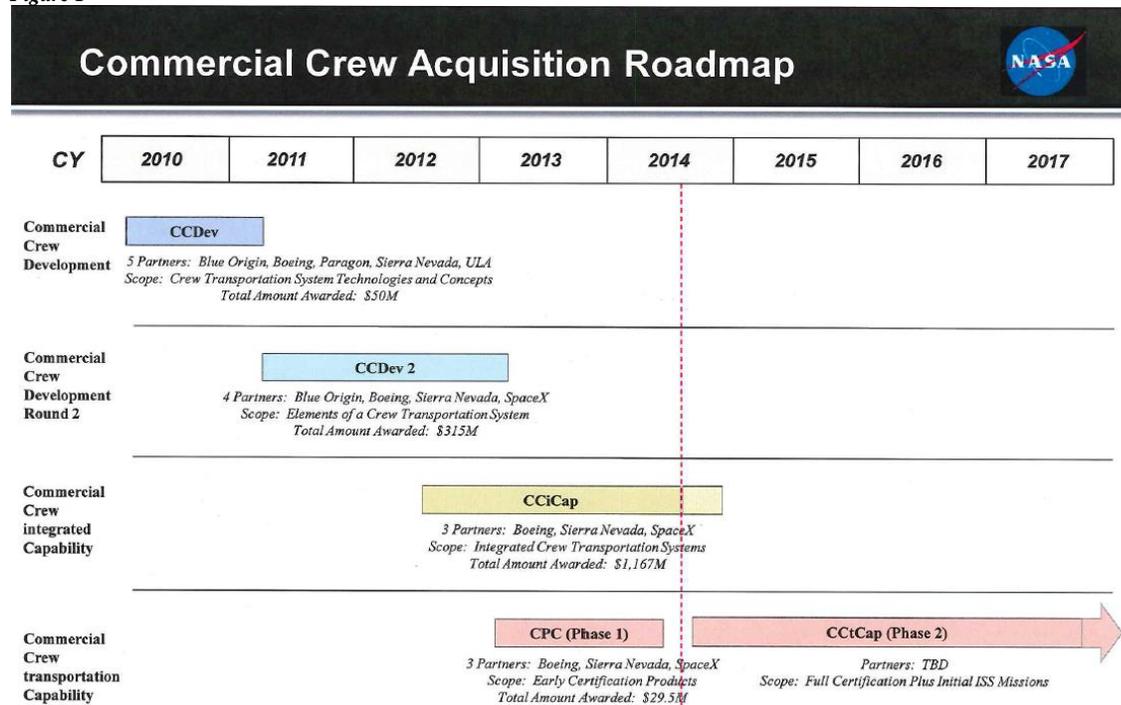
⁹ National Aeronautics and Space Act of 1958, P.L. 85-568, Sec. 203.

development program, this cost-share for the contractors was approximately 50 percent of the cost of the development.¹⁰ The percentage of the cost-share for the Commercial Crew Program is not known, but NASA testified before the Committee in September 2012 that the government expected to provide approximately 80-90 percent of the overall funding for the program.¹¹

The Commercial Crew Program has three phases. The first two phases were referred to as Commercial Crew Development (CCDev) One and CCDev Two. Both phases were conducted under Space Act Agreements. The third phase was called Commercial Crew Integrated Capability (CCiCap) and was also conducted under a Space Act Agreement. The fourth phase, Certification Products Contracts (CPC), allowed NASA and industry to exchange data that would be used to set technical standards for future certification. (See *figure 1* below)

The current phase of the program is called Commercial Crew Transportation Capability (CCtCap), which will mature industry spacecraft designs to a point that they can be certified to fly NASA astronauts to the ISS. NASA awarded firm-fixed price contracts for this phase to Boeing and SpaceX last September. The total potential values of these contracts are \$2.6 billion for SpaceX and \$4.2 billion for Boeing for a total potential value of \$6.8 billion over the life of the contracts. These two companies will proceed through the final design, development, testing, evaluation and human rating certifications under a firm-fixed price contract. With this type of contract, any costs incurred, beyond NASA’s firm-fixed price, are to be borne by the contractor, not NASA. This contract vehicle differs from NASA’s traditional cost-plus acquisition model in developing spacecraft.

Figure 1



¹⁰ NASA Office of the Inspector General, Commercial Cargo: NASA’s Management of Commercial Orbital Transportation Services and ISS Commercial Resupply Contracts, Audit #IG-13-016 <http://oig.nasa.gov/audits/reports/FY13/IG-13-016.pdf>

¹¹ Verbal Testimony of Associate Administrator Bill Gerstenmaier before the House Science, Space and Technology Committee, September 14, 2012. <http://www.gpo.gov/fdsys/pkg/CHRG-112hhrg76234/html/CHRG-112hhrg76234.htm>

Although NASA will not fly astronauts on these systems until they have been certified for launch, the agency will need to procure launches before certification to allow the contractors lead-time to build the vehicles. Additionally, NASA may also include foreign astronauts on these flights to the ISS. The contractors will be required to acquire a launch license from the FAA for all of their post-certification missions to the ISS. This is a change from historic human spaceflight launches in the past. For example Mercury, Gemini, Apollo, and Space Shuttle launches were not licensed by the FAA.

Contractor progress is measured by milestones that they must achieve throughout the contract period. The contractors are paid upon the completion of each of the milestones. There are a total of 41 certification milestones between the two contractors, 23 for Boeing and 18 for SpaceX.¹² After they have completed their milestones and they are certified by NASA as safe to fly astronauts to the ISS, the government will begin to procure flights from the contractor. The contracts allow the government to procure six flights from each partner for a total of twelve flights. However, the contract only guarantees that the government would purchase two post-certification missions to the ISS.

Based on the proposals and contracts from both contractors, NASA still anticipates a flight readiness of at least one partner by the end of 2017. Additionally, NASA estimates that if it uses all the potential flights it will not need to procure additional flights until 2023.

Program Budget

The President's budget request for FY2016 includes \$1.24 billion for the Commercial Crew Program. This would be an increase of 54 percent over the appropriated funding for FY2015 (\$805 million). NASA contends that without this funding, the government would be required to renegotiate their contracts with the providers which would delay flight readiness for the systems. Despite the \$6.8 billion projected value of the contracts, NASA has never completed an independent cost estimate of the Commercial Crew Development Program or the program estimates that the companies provided for their funding requirements.¹³

The NASA Authorization Act of 2010 authorized \$312 million, \$500 million, and \$500 million for the Commercial Crew Program for fiscal years 2011, 2012 and 2013 respectively. NASA has consistently requested more funding for Commercial Crew than the program has been authorized or previously appropriated.¹⁴ Three years ago, the NASA Administrator testified before the Committee that the FY2013 request would put NASA "on track" for a commercial crew capability by 2017.¹⁵ The actual appropriation for FY2013 was \$305 million less than the request. Two years ago, the Administrator testified to the Committee that NASA was still on

¹² Briefings provided by NASA to Committee staff, January 2015.

¹³ NASA contracted with Booz|Allen|Hamilton to complete an independent cost assessment of the program which was released on March 1, 2013 and can be found here http://www.nasa.gov/pdf/741617main_CCP-ICA-DRD-2e-Public-Releaseable-Final-Report-3-5-13-508.pdf. However, as noted by the NASA Inspector General, "the assessment found that the estimates were optimistic, and that the Program was likely to experience cost growth. In addition, Booz Allen noted that without costs projected over the life of the Program, NASA officials will not be able to independently evaluate each partner's progress."

¹⁴ FY2011 request: \$500 million. FY2011 actual: \$307 million. FY2012 request: \$850 million. FY2012 actual: \$392 million. FY2013 request: \$830 million. FY2013 actual: \$525 million. FY2014 request: \$821 million. FY2014 actual: \$696 million.

¹⁵ Charles F. Bolden, Jr., Administrator, National Aeronautics and Space Administration, statement before the House Committee on Science, Space, and Technology, March 7, 2012.

track for a 2017 launch date, but full funding of the FY2014 request was “essential” to enabling Commercial Crew access to the International Space Station by 2017.¹⁶ The actual appropriation for FY2014 was \$125 million less than the request. The FY2016 NASA budget justification states that 2017 is still the target date for a Commercial Crew capability.

Funding history for the program is included below.

Figure 2

Budget Authority (\$ in millions)	Actual FY2013	Request FY2014	\$ Change	Actual FY2014	Request FY2015	\$ Change	Enacted FY2015	Request FY2016	\$ Change
Commercial Crew	525.0	821.4	296.4	696.0	848.3	152.3	805.0	1,243.8	438.8

Funding History \$ in millions	Program Phase						
	Partner	CCDev1	CCDev2	CCiCap	CPC1	CCtCap	Total
Paragon	1.40	-	-	-	-	-	1.40
United Launch Alliance	6.70	-	-	-	-	-	6.70
Blue Origin	3.70	22.00	-	-	-	-	25.70
Sierra Nevada	20.00	105.60	227.50	10.00	-	-	363.10
SpaceX	-	75.00	460.00	9.60	2,600.00*	-	3,144.60
Boeing	18.00	112.90	480.00	9.90	4,200.00*	-	4,820.80
Total Funding	49.80	315.50	1,167.50	29.50	6,800.00	-	8,362.30

Source - <http://www.nasa.gov/sites/default/files/files/CCtCapFactSheet.pdf>

*Represents total potential value of the contract.

Aerospace Safety Advisory Panel (ASAP) Annual Report

The Aerospace Safety Advisory Panel (ASAP) was created by Congress in 1968 after the tragic loss of three astronauts during a launch rehearsal test of Apollo 1.¹⁷ The 1968 Act required the panel to “review safety studies and operations plans that are referred to it and shall make reports thereon, shall advise the Administrator with respect to the hazards of proposed operations and with respect to the adequacy of proposed or existing safety standards, and shall perform such other duties as the Administrator may request.” In 2005 (in the wake of the Space Shuttle *Columbia* tragedy), Congress amended the 1968 Act to require that ASAP report to Congress as well as NASA. In compliance with this requirement, the panel produces an annual report. This year’s report was transmitted to Congress in late January.¹⁸

The report transmitted to Congress this year did not include a proper assessment of the Commercial Crew Program as it did with other large programs at NASA, including the Space Launch System and Orion programs. The panel highlighted specific issues with the Commercial

¹⁶ Charles F. Bolden, Jr., Administrator, National Aeronautics and Space Administration, statement before the House Committee on Science, Technology, and Space, Subcommittee on Space, April 24, 2013.

¹⁷ National Aeronautics and Space Administration Authorization Act of 1968 (P.L. 90-67) Sec. 6.

¹⁸ 2014 Annual Report of the Aerospace Safety Advisory Panel
http://oir.hq.nasa.gov/asap/documents/2014_ASAP_Annual_Report.pdf

Crew Program including concerns about the program's leadership at NASA Headquarters. The reports states that,

“The Commercial Crew Program (CCP) has been notably less forthcoming. This lack of transparency has been a concern for a number of years and, despite numerous discussions with the Director of Commercial Spaceflight Development (DCSD) and with senior leadership at NASA Headquarters, this less-than-candid and transparent communication with the ASAP regarding the CCP has persisted. Over the last several years, the DCSD has responded to ASAP's requests for information related to the plans on how commercial programs would be certified or how confidence would be gained on the safety of operations with a seamless set of constraints as to why the information could not be shared. These have ranged from “we're still defining the acquisition approach” to “that information is pre-decisional” to “the investigation is still being conducted” to “that's source selection sensitive information” to “a protest has been filed.” While these statements are all true, these conditions should not be absolute barriers to sharing information related to certification and safety.”

This lack of transparency was also noted by the Committee after several requests for information from NASA.¹⁹ The ASAP report gives examples of how program leadership prevented candid discussions with the panel about the program,

“Even when subordinates of the DCSD give briefings to the ASAP, there is often obvious concern about how to answer the Panel's questions. For example, the subordinate looking at the DCSD, apparently seeking permission and/or guidance prior to answering a probing question, may be a symptom of an environment where the culture is not one of openness and can lead to poor internal and external communication.”

Further, the Panel notes that,

“The actions of the DCSD in interacting with the ASAP, which were also noted during the development phase of the Commercial Cargo Program, have created a challenging environment that has the potential to increase risk. The Panel is concerned that this lack of candor is not limited to interactions with the ASAP and may extend to other internal and external stakeholders. This opacity and failure to engage in open and transparent communication is reminiscent of the problems that were explicitly identified by both the Rogers Commission and the Columbia Accident Investigation Board (CAIB) regarding causes of the Space Shuttle Challenger and Columbia mishaps respectively.”

¹⁹ Letter to Administrator Bolden from Science Committee Chairman Lamar Smith and Space Subcommittee Chairman Steven Palazzo, October 21, 2014.

Key Questions

1. Does NASA have the appropriate level of insight into the Commercial Crew contractors to be confident in the safety and reliability of the systems?
2. How has NASA responded to the ASAP report and what measures have been put into place to ensure the Panel has insight into the human spaceflight programs at the agency?
3. What milestones or metrics can be used to judge the progress of the development of the crew systems?
4. What options does NASA have if one or both of the contractors are not able to complete their milestones by 2017?
5. How will NASA ensure that the certification process for these systems will not deviate from known standards of safety and reliability?
6. What are the major challenges and risks facing the program and the contractors and how can those challenges and risks be mitigated?