



NASA's Return On Investment Report

Issue 15

April 2014



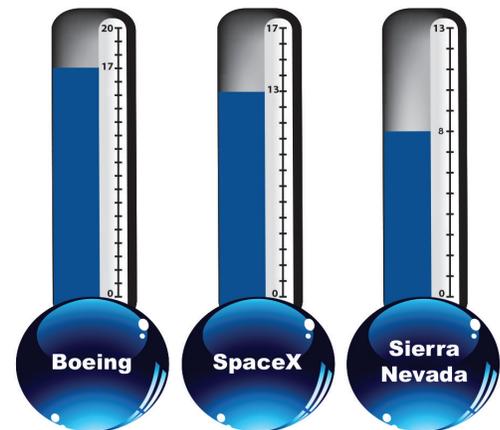
This bi-monthly newsletter of accomplishments, progress, and happenings in NASA's commercial development programs is distributed by the Commercial Spaceflight Development Division at NASA Headquarters.

Commercial Crew Transportation Systems—Progressing to Reality

Milestones achieved by the Commercial Crew Program's (CCP's) partners continue to push commercial spacecraft and transportation systems from design to reality.

Over the past two months, industry partners continued to demonstrate progress by successfully completing the following Commercial Crew integrated Capability (CCiCap) milestones and preparing for significant milestones in the coming months:

- **Successfully Completed**
 - Boeing M17, Pilot-in-the-Loop Demonstration
 - Boeing M10, Spacecraft Primary Structures Critical Design Review
 - SpaceX M7a, Delta Ground Systems Preliminary Design Review
- **Near-Term Work In Progress**
 - Boeing M18, Software Critical Design Review
 - Sierra Nevada Corporation (SNC) M8, Wind Tunnel Testing
 - SNC M9a, Main Propulsion and Reaction Control System Risk Reduction and Technology Readiness Level (TRL) Advancement Testing
 - SpaceX M13, Integrated Critical Design Review



CCiCap milestone completion status: Boeing: 17 of 20; SpaceX: 13 of 17; Sierra Nevada: 8 of 13.

Under its Commercial Crew Development Round 2 (CCDev2) efforts, Blue Origin successfully completed its Subscale Propellant Tank Assembly Review assessing the design, manufacture, and assembly of a subscale booster propellant tank. This milestone is a key step in the development and demonstration of its transportation system. Future flight tests will provide results to inform its orbital transportation system development efforts.

In addition to the CCiCap and CCDev2 effort, NASA is continuing to assess certification product contract deliverables against NASA's safety and performance requirements and is preparing for the next contract phase that will continue to facilitate American companies in sending astronauts to the Space Station from American soil and end our sole reliance on Russia.



Boeing

The Boeing Guidance, Navigation, and Control Team provide manual docking instruction for the CST-100 pilot conducting the pilot-in-the-loop demonstration maneuvers.



Sierra Nevada

The Sierra Nevada Corporation (SNC) wind tunnel testing its integrated transportation system, the Dream Chaser spacecraft and Atlas V launch vehicle.



SpaceX

SpaceX preparing for the parachute drop test of its crewed Dragon spacecraft.

Alternate Requirements and Standards

NASA requirements have been developed over decades, through lessons learned designing, developing, testing, and operating spacecraft and rockets. NASA has taken this experience and developed a comprehensive set of requirements and standards that commercial crew transportation systems will need to address during the current and upcoming verification and certification efforts. NASA has categorized these requirements and standards into three general types:

- **Type 1 requirements:** Partners must meet the NASA requirements as written;
- **Type 2 requirements:** Partners can either choose to adopt the NASA requirements and standards or propose an alternate that meets or exceeds the NASA document; and
- **Type 3 requirements:** Partners do not need to formally adopt the NASA document; rather, NASA documentation forms an integral reference based on our human and non-human spaceflight experience.

This is a significant change to traditional practices where all NASA requirements and standards were Type 1. Allowing our commercial partners to propose and use alternatives enables significant cost efficiencies to be realized and provides a high level of freedom and flexibility in the design process. The flexibility incentivizes innovation, which has been a hallmark of all of NASA's commercial spaceflight endeavors.

When NASA owns and operates the systems, as in traditional spaceflight endeavors such as the Space Shuttle, it is appropriate for contractors to meet all of the agency's requirements and standards as written. This approach ensures that NASA essentially gets exactly what it needs, and it minimizes interface issues.

In contrast, NASA will not own or operate the commercial crew systems—our industry partners will. NASA has found that most aerospace companies have internal standards that are just as good if not better than NASA's. Also, the companies have the responsibility of managing the hardware interfaces. Thus, allowing the companies to use their own standards during the design process is an appropriate approach, and it eliminates costly rework and enables the companies to innovate in meeting NASA's requirements. NASA must approve any alternative standards and requirements through a rigorous review process, thereby maintaining the agency's focus on high quality and lessons learned.

This is one of the many innovative features NASA is employing in its commercial spaceflight activities. These features will ensure NASA and our partners develop safe, reliable, and cost-effective space transportation systems.

Q&A with Phil McAlister on the Collaborations for Commercial Space Capabilities

On March 31, NASA announced that it was moving forward with the "Collaborations for Commercial Space Capabilities" efforts. The purpose of the no-exchange-of-funds agreements is to advance entrepreneurial efforts by facilitating access to NASA's vast spaceflight resources including technical expertise, assessments, lessons learned, technologies, and data. The goal is to advance private sector development of integrated space capabilities so that the emerging products and services are commercially available to government and non-government customers within approximately the next five years. We sat down with NASA Commercial Spaceflight Development Director Phil McAlister for a Q&A session about this new activity.



Phil McAlister

Q: Why is NASA looking for these types of agreements?

A: One of the biggest lessons learned from COTS [Commercial Orbital Transportation Services] and Commercial Crew is that companies benefit greatly from the inherent expertise of NASA's personnel and archived information. While the provision of funds was critical to the success of COTS partners SpaceX and Orbital Sciences and to the Commercial Crew partners, equally important was the ability of these companies to leverage NASA's experience. These agreements will enable that expertise to be leveraged as new space capabilities are developed by private U.S. companies.

Q: How does NASA benefit from these agreements?

A: NASA benefits in many ways. First, congressional and administration policy supports the commercialization of space and directs NASA to pursue innovative partnerships with private industry. Also, these partnerships increase the likelihood that the private sector endeavors will be successful in bringing space-related products and services to market. These partnerships will also strengthen the U.S. space industrial base. In addition, NASA can learn from the private sector activities by being exposed to new and innovative space development approaches. This insight will help NASA incorporate private sector capabilities more fully in our deep-space exploration plans.

Q: Why are no funds being made available for these agreements?

A: NASA envisions the awards being made to primarily entrepreneurial and/or nonprofit endeavors which are not initially seeking Federal funding. Additionally, NASA's current budget environment is extremely challenged. Although no funds will go to the partners, sharing NASA's extensive spaceflight experience and access to its data and infrastructure could be of great value to these endeavors.

Q: Shouldn't these companies learn to stand on their own?

A: NASA's mission has always been to lead the forefront of human spaceflight, to pursue the bold missions throughout its history, and to make those lessons and experiences available to the entire nation and the world. This allows the nation to benefit multiple times from its investment in NASA.

Q: Why issue such a broad solicitation and not one focused on specific capabilities?

A: These agreements are primarily focused on advancing private endeavors for commercial space capabilities. These agreements are not based on specific NASA needs, which are acquired through traditional procurement approaches. The private endeavors will have to be consistent with and supportive of NASA's strategic plan. Overall, we are looking for the intersections of mutual interest. This general call will give NASA a broad picture of commercial space capabilities and enable us to focus our efforts where they are most beneficial to both parties.

Q: Does NASA intend to focus all of its partnership efforts through this announcement?

A: No. This is a broad invitation by our Human Exploration and Operations Mission Directorate for human exploration–related partnerships. There have been, and will continue to be, opportunities to partner with NASA in other ways. This is an additional opportunity to partner with NASA and is not intended to preclude ongoing or future partnership discussions directly with the NASA centers.

For more information on the Collaborations for Commercial Space Capabilities efforts, go to <http://procurement.jsc.nasa.gov/ccsc/>. Awards are expected this summer.

To download the latest information on the Commercial Crew Program, visit
<http://go.nasa.gov/commercial-documents>

For more information on any of the articles in this report, contact Joshua Buck, Rachel Kraft, or Trent Perrotto in NASA's Public Affairs Office at 202-358-1100. To review NASA's other commercial space accomplishments, visit <http://www.nasa.gov/commercial/>.