NASA's Return on Investment Report

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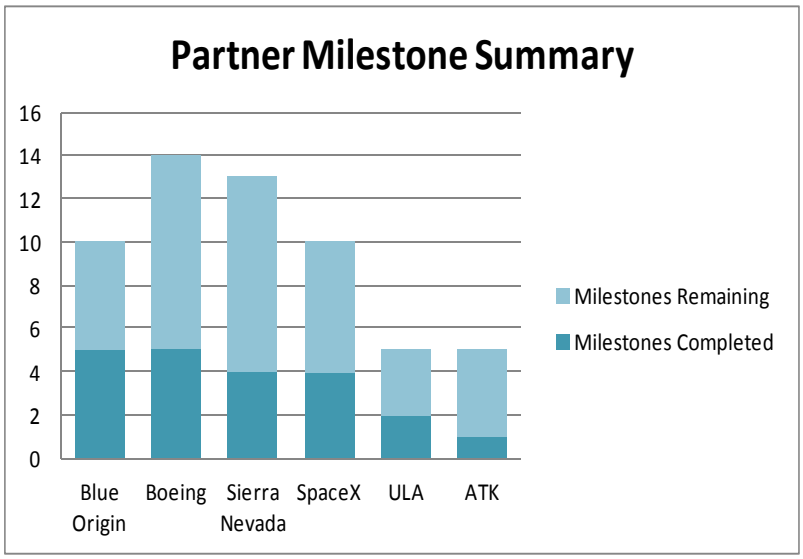
This bi-monthly newsletter of accomplishments, progress, and happenings in NASA's commercial spaceflight development programs is distributed by the Commercial Spaceflight Development Division at NASA Headquarters.

COMMERCIAL CREW DEVELOPMENT INDUSTRY PARTNERS CONTINUE PROGRESS

Over the last two months, NASA's industry partners demonstrated substantial progress toward achieving crewed spaceflight in the middle of the decade by completing six more Space Act Agreement milestones. In just six short months since the Commercial Crew Development Round 2 partners were selected, they have completed 21 of the 57 planned milestones.



The Sierra Nevada Corporation completed their functional Vehicle Avionics Integration Laboratory (VAIL), which will be used to test Dream Chaser computers and electronics in simulated space mission scenarios. Initially, the VAIL will be utilized for developmental testing, and then later as a key tool for Dream Chaser certification.

Blue Origin LLC successfully completed two technical reviews. Their space vehicle Mission Concept Review(MCR)identified proposed mission objectives as well as the design concepts to meet them. Also, in preparation for their Reusable Booster System (RBS) engine component testing next year, Blue Origin presented their test plan and test article interface data to NASA experts.

Space Exploration Technologies (SpaceX) successfully completed a Preliminary Design Review (PDR) of their Launch Abort System propulsion components. This review demonstrated that SpaceX is ready to proceed with detailed design, fabrication, assembly, integration, and testing of the component test articles.

United Launch Alliance completed a Design Equivalency Review (DER), which presented their Atlas V requirements and certification process development to NASA technical experts for feedback.

Boeing successfully completed a major testing milestone for the air bags used to land their capsule (see next article for more information).

A summary schedule showing all completed and planned CCDev2 milestones can be found at http://www.nasa.gov/exploration/commercial

BOEING'S AIR BAG DROP TEST SUCCESSFUL

Together with their Bigelow Aerospace teammates, Boeing successfully completed a series of drop tests in the Mojave Desert to measure the performance of prototype landing airbags for their CST-100 commercial crew spacecraft. When returning from space, the CST-100 will descend on three parachutes. To further cushion the land-based landings, the capsule's heat shield will drop away at about 5,000 feet and six airbags will inflate. To test these bags under real conditions, the team used a unique, one-of-a-kind mobile rig built from a semi-truck with a trailer-mounted crane to simulate landings with both a horizontal and vertical component to landing velocity. At over 11 feet high, the crane provided a vertical drop speed of 18 mph, which is equivalent to the planned rate of descent under the CST-100's parachutes. The truck provided horizontal speeds up to 20 mph.

Boeing's Drop Test Rig

The primary purpose of the drop tests, which were performed as part of Boeing's Commercial Crew Development Space Act Agreement, was to collect engineering data on the impact loads and bag performance to help refine design tools. "These tests allowed us to do early computer simulation models and begin validating those models," said John McKinney, the Landing and Recovery System lead for Boeing's Commercial Crew Development program.

These computer models are now being used to refine the CST-100 airbag designs. More drop testing using the truck-mounted crane will continue in Nevada, leading up to a test of the latest bag designs as part of a fully integrated parachute drop test early next year.

Boeing CST-100 Drop Test Article

Video of the recent drop tests can be seen at:
http://www.boeing.com/Features/2011/09/bds_cst_100_airbag_09_12_11.html

NASA AND ATK FORM NEW PARTNERSHIP

As part of Commercial Crew Development Round 2 activities, NASA and Alliant Techsystems (ATK) have entered into a new agreement for collaboration on the development of ATK's commercial Liberty launch system. The agreement is an unfunded Space Act Agreement (SAA) which means no money will exchange hands, but each party will benefit.

"This unfunded SAA will provide the opportunity to look at the Liberty system to understand its design solution and risks, its capabilities and how it could be used to fly our NASA crew," said Ed Mango, NASA's Commercial Crew Program manager.

ATK and NASA experts will review and discuss Liberty system requirements, safety and certification plans, computational models of rocket stage performance, and avionics architecture designs. A launch system "Initial System Design" review also is planned, where ATK will formally present the Liberty systems-level requirements, preliminary design, and certification process development.

"With this SAA, we believe NASA will benefit from gaining insight into the various systems we are developing, and we can benefit from the feedback," said Kent Rominger, ATK vice president and program manager for Liberty.

A copy of the Agreement has been posted to the Kennedy Space Center Procurement Website at http://procurement.ksc.nasa.gov/index.htm.

Artist's Rendering of ATK Liberty Launch System

NASA SHUTTLE AND ISS ASTRONAUTS SUPPORT COMMERCIAL CREW EFFORTS

NASA is engaging technical experts of all kinds from across the agency to help our commercial partners mature their crew transportation capabilities during Commercial Crew Development Round 2. As a key element of this support, NASA has assigned experienced NASA astronauts to work closely with our partners to help them develop and demonstrate crewed spacecraft systems. NASA's crew members evaluate the partners' designs, and provide them feedback and recommendations based on lessons learned from their real experiences living and working in space.

NASA Crew Members Evaluating CST-100 Mock-up

"NASA's 50-plus years in human spaceflight has resulted in a wealth of experience among a wide range of disciplines, including engineers, flight directors, flight controllers, and astronauts," says astronaut Lee Archambault. "NASA is now leveraging this expertise by placing several of its astronauts on the partner integration teams assisting the commercial partners in their development activities."

The NASA astronauts assigned to work with commercial partners are:

- Blue Origin – Tim Kopra, Colonel USAF (ret), Mission Specialist on ISS Expedition 20
- Boeing – Mike Foreman, Captain, USN, Mission Specialist on STS-123 and 129
- SpaceX – Tony Antonelli, Commander, USN, Pilot on STS-119 and STS-132
- Sierra Nevada – Lee Archambault, Colonel, USAF, Pilot on STS-117, Commander on STS-119
- United Launch Alliance – Stan Love, Ph.D., Mission Specialist on STS-122
- ATK – Scott Tingle, Commander, USN, selected as a NASA astronaut in 2009, graduate of Astronaut Candidate Training

For more information on any of the articles in this report, contact Michael Braukus in NASA's Office of Communications at 202-358-1979.

Stay tuned for future editions of the Return on Investment. In the meantime, feel free to review some of NASA's other commercial space accomplishments at http://www.nasa.gov/exploration/commercial.