

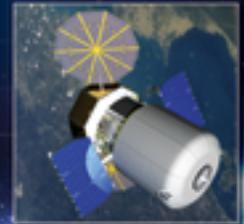


Status of COTS and Commercial Crew

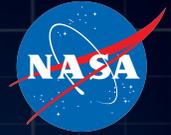
Briefing to NAC Exploration Committee

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January 11, 2011



Agenda



- Commercial Orbital Transportation Services (COTS) Status
 - SpaceX
 - Orbital Sciences
- Commercial Crew Development (CCDev) Status
- Commercial Crew Development Round 2 (CCDev 2) Status
- Commercial Crew Update

SpaceX Status



- Milestones 1-17, and 20 completed for payments to date of \$258M out of \$278M.
- Falcon 9 maiden flight successfully reached orbit on June 4.
- Commercial Orbital Transportation Services (COTS) Milestone 17 - Demo Flight 1 successfully accomplished on December 8.
 - All primary mission objectives successfully demonstrated
 - Falcon 9 launch and Dragon insertion to orbit
 - Dragon separation
 - Safe reentry
 - All other mission objectives successful
- Demo Flight 2 mission planned for June 2011.
 - Rendezvous and proximity operations with International Space Station (ISS)
 - ISS communication demonstration
- Demo Flight 3 mission planned for September 2011.
 - Berthing operations with ISS
 - Cargo transfer demonstration
- SpaceX has proposed combining Demo Flight 2 and 3. NASA is considering that proposal.

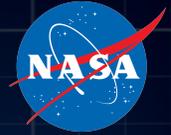


Falcon 9 Maiden Flight, Cape Canaveral

Demo Flight 1 Images



Orbital Status



- Milestones 1-16, and 19 completed for payments to date of \$157.5M out of \$170M total.
- COTS Milestone 19 – Cargo Integration Demo, completed at Thales Alenia in Italy Dec 1-3.
- NK-33 engine successfully tested in Russia and first AJ-26 hot fired at Stennis Space Center.
- Ground infrastructure at Wallops Flight Facility under construction.
- COTS demo flight planned for October 2011, demonstrating:
 - Launch vehicle operations
 - Cygnus orbital operations
 - ISS proximity and berthing operations
 - ISS departure and destructive re-entry ops



NK-33 1st Stage Engine Testing



Pressurized Cargo Module



TII 1st Stage Static Test Article



Launch Pad Construction at WFF

COTS Summary



- Both providers are making good progress in their development efforts.
- While there have been some schedule slips, the degree of schedule slippage is completely consistent with NASA's historical experience on robotic and new spacecraft missions.
- Both SpaceX and Orbital have a very challenging year ahead. Some anomalies during the test flights would be consistent with historical spacecraft development efforts.
- NASA stands to gain two new launch vehicles, two spacecraft capable of delivering cargo to ISS, and all the associated ground and launch infrastructure for a very modest investment relative to historical experience.

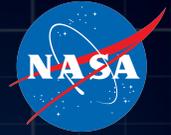
Commercial Crew Development (CCDev)



- The NASA Recovery Act stimulus funding, included \$50M to stimulate efforts within the private sector to develop and demonstrate technologies that enable commercial human spaceflight capabilities.
- On February 1, 2010 five partners were announced and received funding:
 - Blue Origin
 - Boeing
 - Paragon
 - Sierra Nevada Corporation
 - United Launch Alliance
- All Agreements were concluded by December 2010, although ULA and Boeing have received no-cost extensions through April 2011.

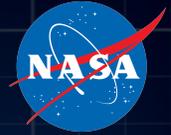


Commercial Crew Development Round 2



- CCDev 2 Announcement for Proposals was released to industry on October 25, 2010. Proposals were due on December 13, 2010.
- The goals of CCDev 2 investments are to:
 - advance orbital commercial CTS concepts
 - and enable significant progress on maturing the design and development of elements of the system, such as launch vehicles and spacecraft, while ensuring crew and passenger safety,
 - with the overall objective of accelerating the availability of U.S. CTS capabilities.
- New competition open to all U.S. commercial providers for NASA Space Act Agreements (SAAs).
- Pay-for-Performance milestones, April 2011 to no later than May 2012.
- CCDev 2 awards are planned to coincide with the FY11 appropriation (estimated for March) which will determine the exact amount available for awards.
- ***NASA is currently in a BLACK-OUT period with industry regarding CCDev 2. All information above is public and has been previously disclosed.***

Commercial Crew Objectives and Approach



- The objective of the proposed commercial crew initiative is to facilitate the development of a U.S. commercial crew space transportation capability with the goal of achieving safe, reliable, and cost effective access to and from low Earth orbit (LEO) and the ISS. Once the capability is matured and expected to be available to the government and other customers, NASA could purchase commercial services to meet its ISS crew transportation needs.
- Preliminary Approach:
 - Competition among multiple commercial partners is a fundamental aspect of NASA's approach. Competition: incentivizes performance, supports cost effectiveness, and does not leave NASA dependent on a single provider even if a provider drops out or is terminated.
 - Use of pre-negotiated, milestone-based agreements with industry investment.
 - Framework should accommodate a diversity of people (e.g., astronauts, international partner personnel, scientists, spaceflight participants) for a variety of reasons (e.g., science, research, station operations, tourism).
 - Incorporate performance objectives and a concept of operations that are as high-level as possible, providing commercial partners with maximum flexibility to propose a variety of safe and cost effective system solutions.
 - Rely on NASA human spaceflight certification for ISS crew transportation missions.

Timeline

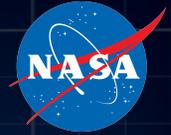


Fiscal Year 2011 2012 2013 2014 2015 2016 2017 2018 2019 2020



- The 2010 NASA Authorization Act established commercial crew as the primary means for ISS crew transportation.
- Congress has signaled its intent to fully fund the commercial crew initiative over six years instead of the originally-planned five years. Given this, NASA believes funding multiple commercial partners during development is still feasible with services capability in late 2016 (dependent on industry proposals and progress and future funding).
- NASA has and will readjust its plans to be consistent with Congressional direction provided in authorization and appropriations laws, including Continuing Resolution(s).

CCDev / Commercial Crew Summary



- CCDev 1 is essentially complete.
- CCDev 2 is underway. It is modeled after CCDev 1 but allows NASA and industry to make significant progress towards maturing commercial crew designs and system concepts.
- NASA is simultaneously planning for the full Commercial Crew Program.
- We are on track with our crew transportation system certification requirements (i.e., human rating).
- As always, near-term and out-year budget is a concern.
- NASA is attempting to define and implement a new way of doing human space transportation. Many challenges will need to be addressed. Strong support from all stakeholders is critical to success.
- If successful, the commercial crew initiative will:
 - End the gap
 - Result in safe, reliable, cost effective crew transportation to LEO and for the ISS
 - Free NASA's limited resources for beyond-LEO capabilities
 - Reduce reliance on foreign systems
 - Transform human spaceflight for future generations