



Commercial Spaceflight Status Briefing to NAC

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Agenda



- Commercial Cargo Status
- Commercial Crew Development Round 2 (CCDev2) Status
- Commercial Crew Program (CCP)

Commercial Cargo – Orbital Sciences Status



- Orbital has completed 24 of 29 milestones and received \$266.5M out of \$288M.
- All Test Flight hardware at WFF (except fairing)
- Completed Transporter/Erector/Launcher (TEL) pathfinder activities
- Integrated engines and aft bay to the ground test article
- Began RP-1 loading into the launch pad tanks
- Orbital Antares test flight planned for NET June 2012



Cygnus Service Modules



Engine ATP @ SSC



Engines on Core Stage



Pathfinder @ WFF Pad

Commercial Cargo – SpaceX Status



- SpaceX has completed 37 of 40 milestones and received \$376M out of \$396M.
- C2+ spaceflight hardware delivered to Cape Canaveral launch site.
- Completed Wet Dress Rehearsal #3.
- C2+ mission NET April 30.

• Key C2+ Mission Objectives

- GPS Navigation (Absolute and Relative)
- Free Drift
- ISS Communications and Commands

C2

- LIDAR (range/rate)
- Retreat
- Hold
- ISS Berthing
- Cargo Transfer/Return

C3



Falcon 9-3, Pad 40 Hangar



COTS Demo Dragon Capsule @
Cape Canaveral



WDR#3 @ Cape Canaveral

Commercial Cargo – What Keeps Me Up at Night?



- An inappropriate amount of importance may be placed on the success/failure of the next COTS Demonstration Missions by stakeholders.
- The upcoming COTS Demonstration Missions are test flights.
 - NASA views test flights as primarily learning opportunities
 - Historically, 65% of new U.S. commercial launch vehicles have experienced a failure within the first three flights
- If the upcoming COTS Demonstration Missions are successful, then SpaceX and Orbital will have achieved significant milestones; but, care and attention will have to be paid to every single subsequent flight, just as it is for all space missions.
- Conversely, if there is a failure or significant anomaly, then SpaceX and Orbital will need to understand the cause of the failure, develop and implement corrective actions, and continue to make progress towards the next mission. The upcoming Demonstration missions, while important, are not a “make or break” missions for U.S. commercial cargo transportation development.

Commercial Crew Development (CCDev2) – Funded Partners



Blue Origin



- Maturing their space vehicle design through System Requirements Review, their Pusher Escape System, and accelerate engine development for their Reusable Booster System
- Successfully completed 5 of 10 milestones and received \$11.2M out of \$22M
 - Space vehicle mission concept review
 - Engine thrust chamber assembly interface & test plan review



- Maturing their CTS design through Preliminary Design Review and performing development tests
- Successfully completed 8 of 15 milestones and received \$65M out of \$112.9M
 - Delta systems definition review
 - Phase 0 safety review
 - Landing air bag drop demonstration



- Maturing their Dream Chaser design through Preliminary Design Review and conduct hardware testing including an unpowered free flight test
- Successfully completed 7 of 15 milestones and received \$62.5M out of \$105.6M
 - System requirements review
 - Flight Control Integration Laboratory
 - Engineering Test Article Structure Delivery



- Maturing their Falcon 9/Dragon system focusing on developing a side-mounted Launch Abort System (LAS)
- Successfully completed 6 of 10 milestones and received \$55M out of \$75M
 - LAS Propulsion Conceptual Design Review
 - Design Status Review #1 and #2
 - Crew Accommodation In-Situ Trial



- Unfunded Space Act Agreement (SAAs) awarded to provide limited technical assistance for advancement of commercial crew space transportation concepts.

- *United Launch Alliance awarded July 2011*

- 4 of 5 milestones completed
 - Launch vehicle design equivalency review and tailored SRR completed



- *Alliance Techsystems, Inc (ATK) awarded September 2011*

- 3 of 5 milestones completed
 - Launch system initial system design review completed



- *Excalibur Almaz, Inc (EAI) awarded October 2011*

- 2 of 5 milestones completed
 - System Requirements Status Review completed



Commercial Crew Program Status

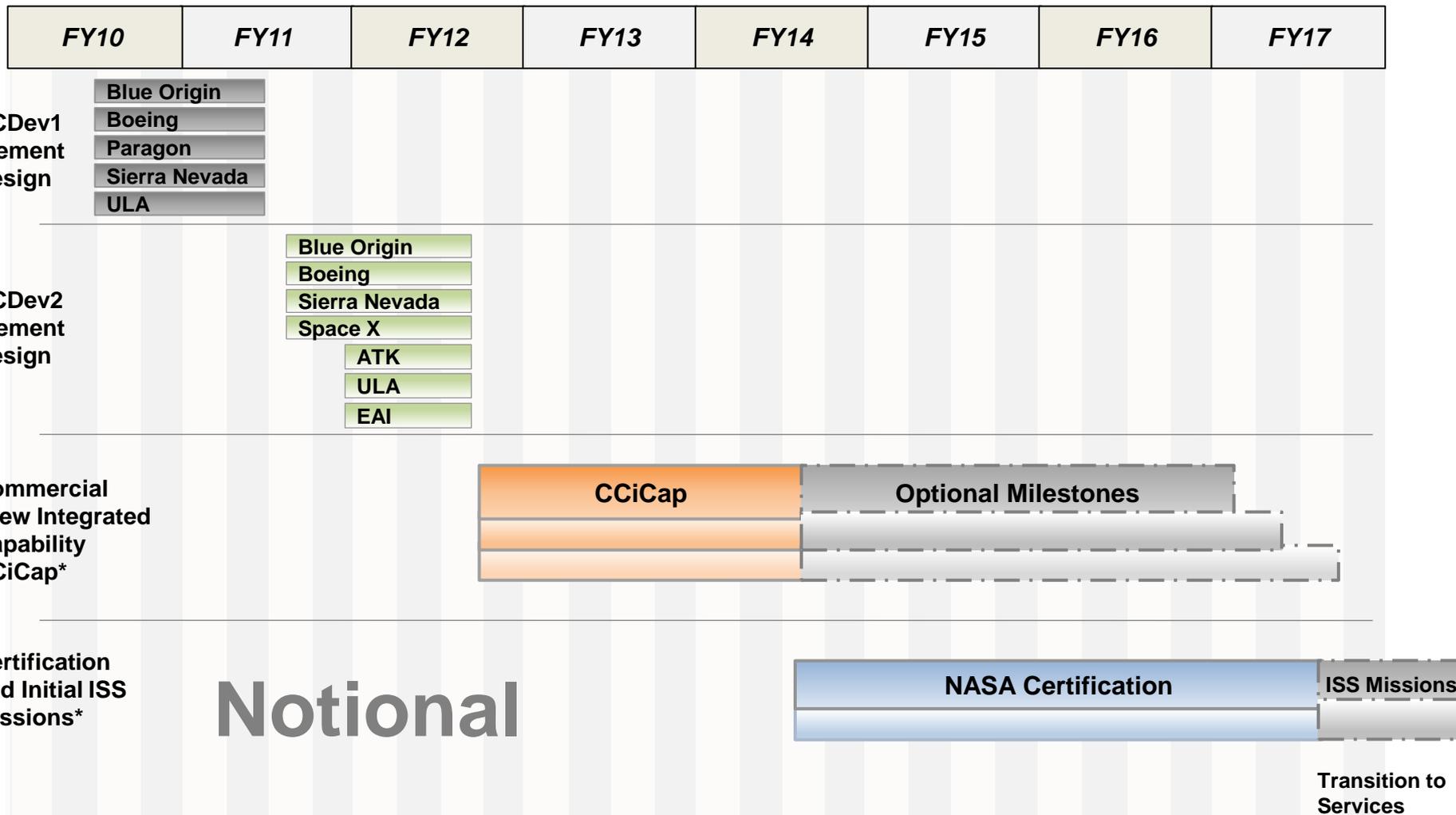


- The objective of the Commercial Crew Program is to facilitate the development of a U.S. commercial human space transportation capability with the goal of achieving safe, reliable, and cost effective access to and from low-Earth orbit (LEO) and the International Space Station (ISS).
- Once the capability is matured and expected to be available to the Government and other customers, NASA plans to purchase commercial services to meet its ISS crew transportation needs.
- These basic objectives have remained unchanged since the program was unveiled in the Spring 2010. However, the timing and strategy for achieving the objective has shifted.
- This change in approach was driven by lower than expected annual budget levels and general uncertainty in future year budget availability. NASA's new approach will retain competition in the domestic commercial market while permitting the Agency to focus limited resources to support continued progress toward a commercial crew transportation system capability.



- Rather than moving forward with a firm-fixed price contract for design, NASA will continue to support the design and development of commercial crew transportation systems through the use of funded Space Act Agreements (SAAs).
- Funded SAAs are more cost effective in the current budget environment than the fixed-price contracts previously planned.
 - Funded SAAs provide NASA with more flexibility to fund providers during the period of performance, as funding levels become known.
 - Funded SAAs provide NASA with limited liability in the event NASA is required to terminate or renegotiate the SAA in the event of funding constraints.
 - Under an SAA, the provider is responsible for determining the best approach to the design and development of its commercial system. HEOMD believes leaving this flexibility in the hands of the providers will permit the providers maintain a rapid pace of technical development despite lower funding levels.
- After the Space Act Agreement phase, NASA will transition to the use of FAR-based contracts for subsequent phases. FAR-based contracts will enable NASA to complete the “certification” of crew transportation systems for use by NASA for crew transportation and rescue services. Through this process, NASA will ensure that all the necessary NASA safety and performance requirements are met.

Commercial Crew Program Strategy



*Number of awards to conform to budget



- Delaying the transition to FAR-based contracts will prevent NASA from mandating compliance with certification requirements during the next phase of SAAs. NASA expects to address this issue in several ways.
 - NASA plans to have more than one company in the next phase of SAAs. This competitive environment provides strong incentive for the companies to meet NASA's certification requirements in order to remain competitive for future awards. The safest system will compete favorably for future procurements.
 - NASA has made its requirements available to all providers for reference. NASA anticipates that providers will use that information to inform their development efforts thereby reducing the technical risk associated with the lack of NASA oversight under an SAA.
 - NASA intends to structure the certification phase to permit the Agency to fully evaluate the technical progress of the providers and accommodate any necessary redesign to ensure compliance with NASA requirements. The providers will not only be required to meet the NASA requirements in order to fly NASA personnel, but they will also have to show how the design and hardware will be verified to meet these requirements..
- CCP is developing preliminary options to successfully transition from CCI-CAP to certification of crew transportation system designs.

Commercial Crew – What Keeps Me Up at Night



- A universal risk has been identified at the HQ-level, the Program-level, and within each of our partners projects:
 - The funding for commercial crew may remain lower than expected and needed. If this continues to be the case, NASA will be forced to reduce the technical scope of the SAAs, thereby delaying service availability and extending NASA's reliance on foreign providers for human space transportation.
- NASA has inherent flexibility within the SAAs to accommodate lower funding levels. However, this is only a tactical fix. The strategic issue of continued reliance on foreign providers with only a single string of redundancy for crew transportation to the ISS will continue to be an issue.
- NASA's other exploration programs are also important and equally financially stressed. Together with the capabilities to explore deep space provided by the Space Launch System and the Orion Multi-Purpose Crew Vehicle, NASA must balance its many needs to move forward on a robust, comprehensive U.S. human spaceflight program.