Commercial Crew Program Overview

Masters Forum 20

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CCP Objective

CCP is leading NASA’s efforts to develop an American-made commercial capability for crew transportation and rescue services to the ISS following this year's retirement of the space shuttle fleet.

- Kennedy Space Center will host the program office dedicated to enabling commercial human spaceflight capabilities.
  - Program Manager (PM) will reside at KSC
  - Deputy Program Manager located at JSC

Program Mission

- Manage the investment in the development of commercial end-to-end space transportation systems
- Manage the CTS (Crew Transportation System) certification process
- Lead the technical and programmatic partner integration and approval functions
CCT-1100 Series Documents

ESMD -CCTSCR-12.10
Agency and HQ Level Requirements levied on the Program intended to certify a CTS to carry a NASA crewmember to LEO

CCT-PLN-1100
High Level Program Summary of roles, responsibilities, and interfaces between CCP and partners in the development of CTS, and How NASA and the CP will work together to achieve a Certified Human Flight Vehicle

CCT-REQ-1130
Crew Transportation and Services Requirements - must meet to transport NASA Crew to the ISS

SSP 50808
ISS Visiting Vehicle Requirements - must comply with to interface with the International Space Station

CCT-PLN-1120
Crew Transportation Technical Management Processes - summary of technical management processes that support certification and expectations for evidence of compliance

CCT-STD-1140
Crew Transportation Design Standard Guidelines - provides expectations, and criteria used in evaluation of technical standards

CCT-STD-1150
Crew Transportation Operations Standard Guidelines - provides expectations for minimum criteria and practices for operations

CCT-DRM-1110
Crew Transportation System DRMs - potential reference missions for current and evolvable systems architecture designs
NASA will perform insight/oversight on the Commercial Partner’s design, development, and certification process to evaluate the end-to-end crew transportation system.
### Commercial Crew Structure and Timelines

<table>
<thead>
<tr>
<th>Title</th>
<th>Purpose</th>
<th>2010</th>
<th>2011</th>
<th>2012</th>
<th>2013-2016</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>CCDev</strong></td>
<td>Develop and demonstrate technologies that enable commercial human spaceflight capabilities.</td>
<td><img src="#" alt="February Awards" /></td>
<td><img src="#" alt="April All Agreements Complete" /></td>
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<tr>
<td><strong>CCDev Round 2</strong></td>
<td>Mature the Design and Development of elements of the system, such as launch vehicles and spacecraft.</td>
<td><img src="#" alt="October Announcement for Proposals" /></td>
<td><img src="#" alt="April Awards" /></td>
<td><img src="#" alt="May Agreements Complete" /></td>
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<tr>
<td><strong>CCP Phase I Design</strong></td>
<td>Design of integrated commercial crew systems.</td>
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<tr>
<td><strong>CCP Phase II DTEC</strong></td>
<td>Mature Development, Test Evaluation &amp; Certification of end-to-end systems. Prepared for services to ISS by end of 2016.</td>
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*Under Development*
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 (ULA)

- All Agreements were concluded by December 2010, with the exception of ULA and Boeing who received no-cost extensions to April 2011.
Commercial Crew Development Round 2
CCDev2
<table>
<thead>
<tr>
<th>Participant Name</th>
<th>Work Summary</th>
<th>NASA Funding</th>
</tr>
</thead>
<tbody>
<tr>
<td>Blue Origin</td>
<td>Space Vehicle design to SRR, pusher escape ground and flight testing, and engine pump and thrust chamber testing</td>
<td>$22,005,000</td>
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<tr>
<td>Boeing</td>
<td>CST-100 design maturation to PDR and launch vehicle integration</td>
<td>$92,300,000</td>
</tr>
<tr>
<td>Sierra Nevada Corporation</td>
<td>Dream Chaser crew transportation system design maturation to PDR and component testing</td>
<td>$80,000,000</td>
</tr>
<tr>
<td>SpaceX</td>
<td>Side-mount LAS engine design maturation and partner-funded crew accommodation prototype</td>
<td>$75,000,000</td>
</tr>
<tr>
<td><strong>Total Funding</strong></td>
<td></td>
<td><strong>$269,305,000</strong></td>
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</tbody>
</table>
System Description: Crew transportation system comprised of a reusable biconic Space Vehicle launched first on an Atlas V launch vehicle and then on Blue Origin’s own Reusable Booster System.

System Description: Commercial crew transportation system comprises the reusable CST-100 spacecraft, launch services, and ground systems. CST-100 is compatible with multiple launch vehicles and is reusable for up to ten missions.

CCDev2 Content: Mature CST-100 design through Preliminary Design Review & perform development tests.

NASA investment: $92.3M
System Description: Dream Chaser is a reusable, piloted lifting body, derived from NASA HL-20 launched on an Atlas V.

CCDev2 Content: Mature Dream Chaser design through a Preliminary Design Review with some subsystems to Critical Design Review, and conduct significant hardware testing.

NASA investment: $80M
System Description: The crew transportation system is based on the existing Falcon 9 launch vehicle and Dragon spacecraft which have been designed since inception for crew carriage with relatively minimal modification. Both the longest-lead and most safety-critical system is the Launch Abort System.

CCDev2 Content: Mature the flight-proven Falcon 9 / Dragon transportation system focusing on developing an integrated, side-mounted Launch abort System.

NASA investment: $75M
A successful Commercial Crew Program will:

- Transform human spaceflight for future generations
- Result in safe, reliable, cost effective crew transportation to LEO and in support of ISS
- Free NASA’s limited resources for beyond-LEO capabilities
- Reduce reliance on foreign systems