Commercial Cargo and Crew Update

NAC CSC Meeting

July 30, 2013

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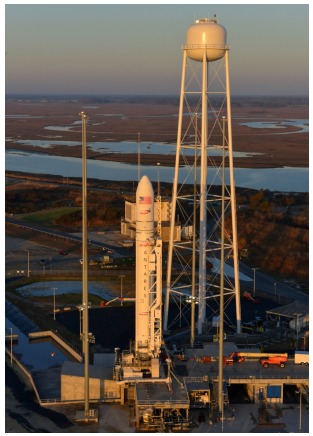
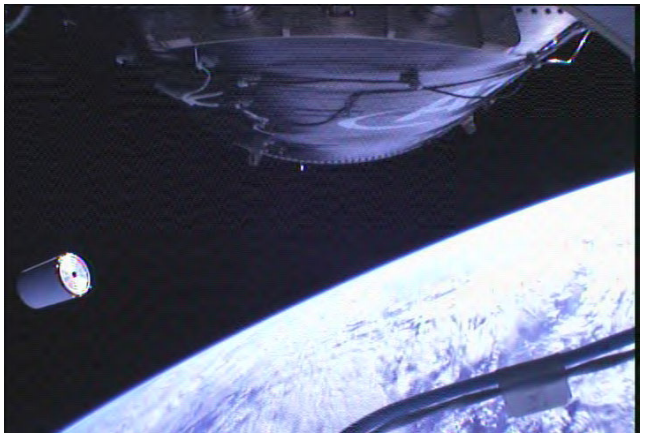
NASA HQ

Commercial Cargo Status

- SpaceX successfully completed all COTS milestones in May 2012. Regular resupply flights to the ISS have commenced.
- Orbital successfully completed a maiden test flight of its Antares rocket on April 21, 2013 from the Mid-Atlantic Regional Spaceport.





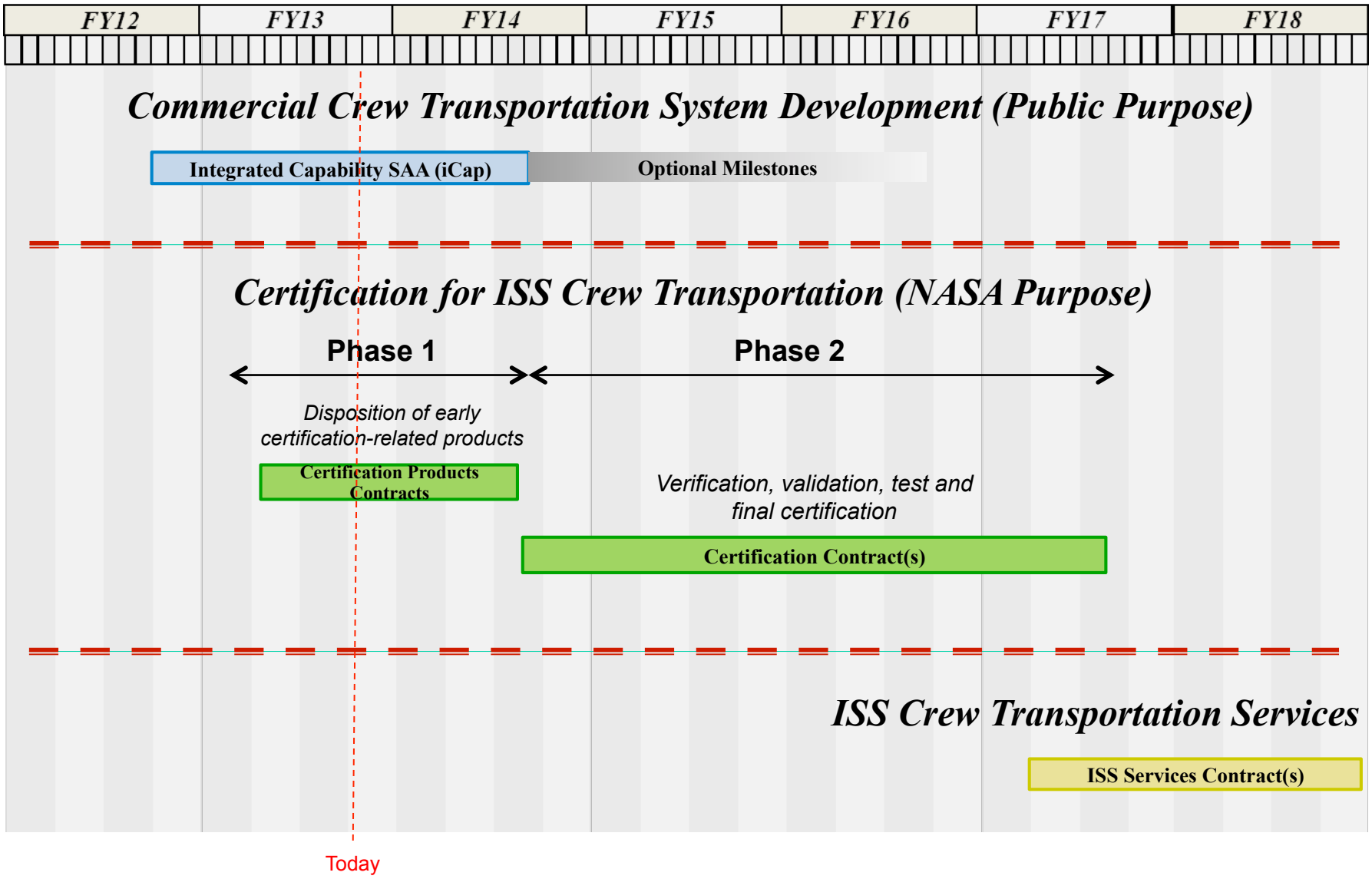
- Orbital successfully conducted the COTS Demo Mission Readiness Review on June 26, 2013. No outstanding actions.
- Tentative launch window for the COTS Demo Mission to the ISS (i.e., the final Orbital COTS milestone) is September 14-19, 2013.

What Did Commercial Cargo Accomplish?

- What was Commercial Cargo supposed to do?
  - Facilitate U.S. private industry demonstration of cargo space transportation capabilities with the goal of achieving safe, reliable, cost effective access to low-Earth orbit.

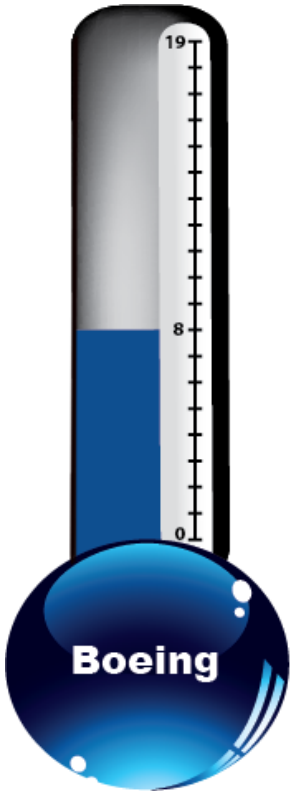
- What did Commercial Cargo actually do?
  - Produced two new low-cost U.S. launch vehicles, two new autonomous cargo spacecraft capable of carrying cargo to and from the ISS, and two new privately developed launch facilities at Cape Canaveral, FL and Wallops, VA.
  - Providing future robustness needed for ISS cargo transportation.
  - Providing NASA Science missions with two medium class launch vehicle options.
  - Helping to recapture U.S. market share for commercial launches.
  - Developed for about $800M from NASA.

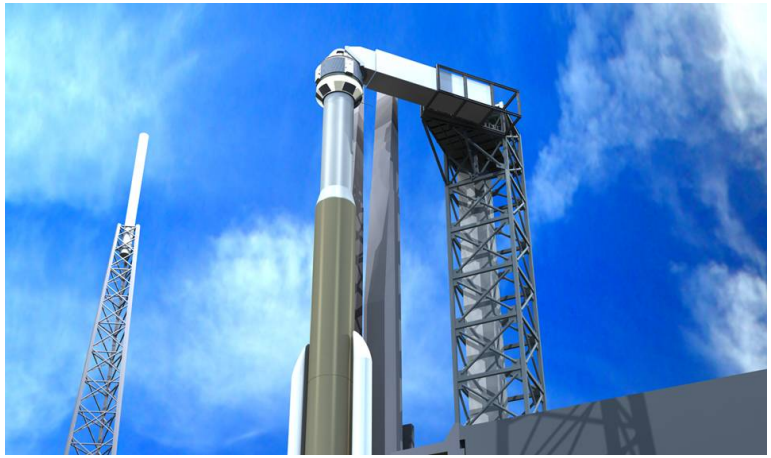
Commercial Crew Program (CCP) Roadmap



CCiCAP – Boeing Status

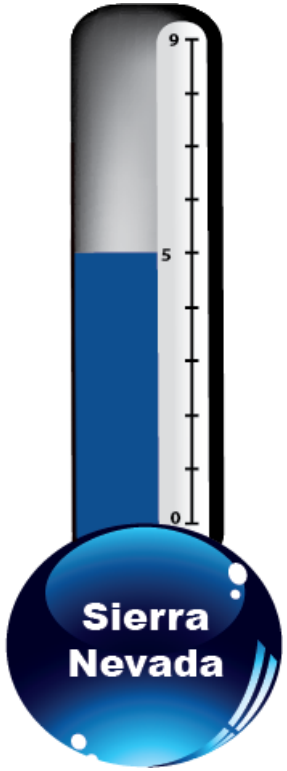
- Boeing has successfully completed 8 of 19 milestones under CCiCAP to date.
- In April, Boeing completed the Integrated Stack Force and Moment Wind Tunnel Test which validated predictions on integrated Crew Module/Service Module /Launch Vehicle stack for ascent.
- In May, Boeing completed the Dual Engine Centaur Liquid Oxygen Duct Development Test which provides interface loads and water flow testing for Dual Engine Centaur liquid oxygen feed ducts.





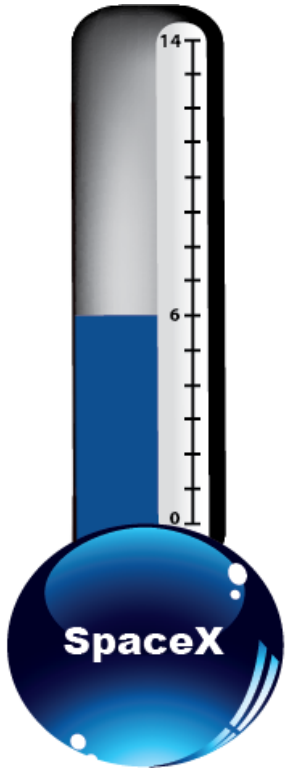
CCiCAP – Sierra Nevada Status

- Sierra Nevada has successfully completed 5 of 9 milestones under CCiCAP to date.
- In February, Sierra Nevada completed the Integrated System Safety Analysis Review #1 which demonstrated that the systems safety analysis of the Dream Chaser Space System has been advanced to a preliminary maturity level.
- In June, Sierra Nevada completed the Investment Financing #1 milestone which represented Sierra Nevada's commitment for co-investment.



CCiCAP – SpaceX Status

- SpaceX has successfully completed 6 of 14 milestones under CCiCAP to date.
- In April, SpaceX completed the Pad Abort Test Review which demonstrated the maturity of the pad abort test article design and test concept of operations.
- In May, SpaceX completed the Human Certification Plan Review which covered plans for certification of the design of the spacecraft, launch vehicle, and ground and mission operations systems. The purpose of the review was to define in detail the SpaceX strategy leading to an orbital demonstration flight with crew.



Phase 1: Certification Products Contracts (CPC)

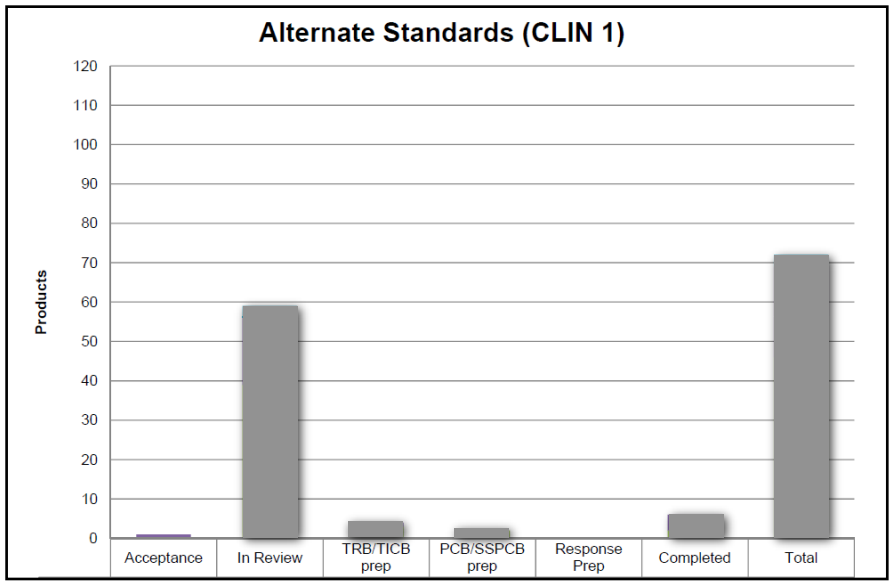
- Primary objective of CPC is the delivery, technical interchange, and NASA disposition of early lifecycle certification products.
  - CPC is Phase 1 of the certification process. It is improving the shared understanding of what will be required for full certification.
  - Fixed-price contract with defined deliverables.

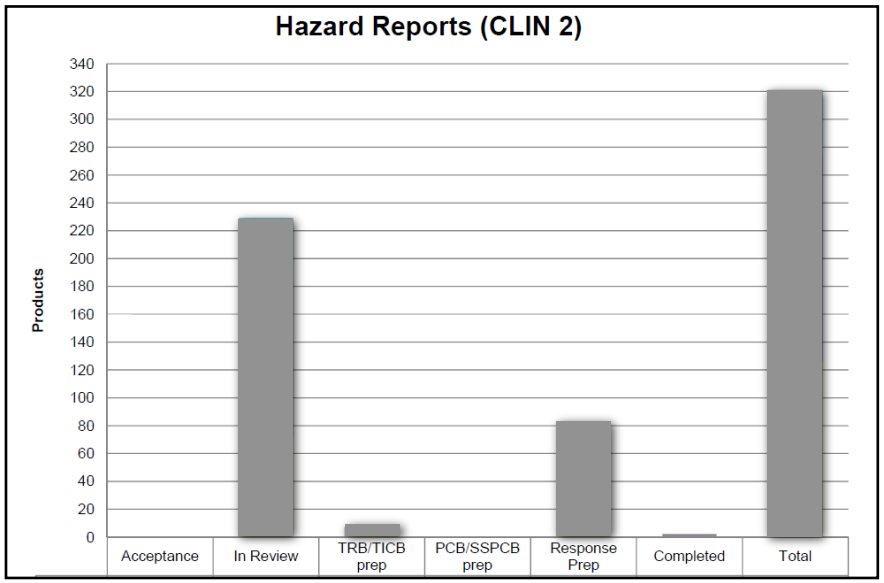
- Companies must provide two sets of deliverables (initial and final) for each of the four Contract Line Items (CLINs).
  - CLIN 1: Alternate Standards
  - CLIN 2: Hazard Reports
  - CLIN 3: Verification and Validation Plan
  - CLIN 4: Certification Plan

- NASA will negotiate, approve, or disapprove contractor requests for variances in CPC.

Certification Products Contracts – Status

- All three CPC contractor/partners met the Phase 1 requirements on all four CLIN deliveries.
- The Commercial Crew Program and the ISS Program teams are focused on the review of the products and deliverables.
- Our progress over the next month will inform us on our ability to hold to the schedules.





Phase 2: CCtCAP

- Phase 2: Commercial Crew transportation Capability (CCtCAP) will cover all aspects of final development and certification of a crew transportation system, including design, manufacturing, testing, qualification, production and operation.

- NASA will approve the final verifications and certification activities. The final certification package will be submitted to the Agency PMC for acceptance.

- The draft RFP for CCtCAP was released for comment on July 19. Award(s) are planned for next Summer.

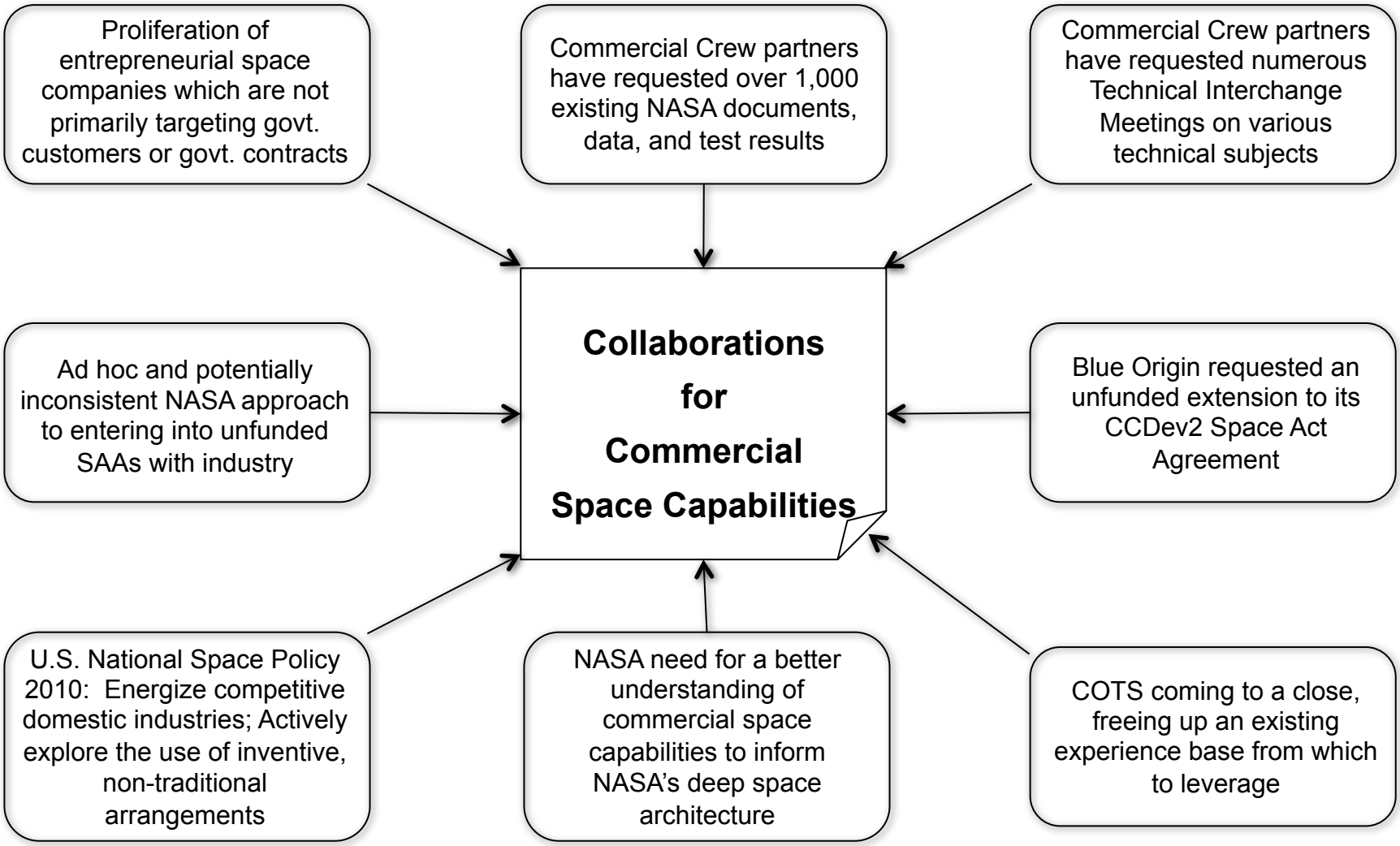
- HEOMD believes we have developed a certification strategy with all the necessary data rights and requirements to enable the Agency to certify systems as safe enough for NASA personnel.

CCP Risks

- Prematurely eliminating competition is one of the primary risks to NASA satisfying the goals and objectives of the Program.

- Competition among more than one industry partner during the development phase is important to safety and cost effectiveness.
  - A competitive environment provides strong incentive for companies to meet and exceed NASA's safety certification requirements
  - Competition prevents NASA from becoming dependent on a sole provider regardless of safety or cost implications
  - Competition supports cost-sharing by industry which augments government funds and encourages industry partners to "stay in the game" when encountering difficulties

Genesis of Collaborations Synopsis



Collaborations Synopsis

- Competitive announcement for the award of multiple Space Act Agreements (SAAs) to advance entrepreneurial space-related efforts
  - No exchange of funds
  - NASA provides technical expertise, lessons learned, and data
  - Industry performs the development and bears the cost of its participation
  - Focuses on the development of integrated space capabilities, not individual technologies or subsystem development efforts
  - Efforts must be consistent with Strategic Goal 1: *extend and sustain human activities across the solar system*
  - Open to U.S. private interests, including non-profits
  - Additional opportunity to partner with NASA and not intended to preclude ongoing or future partnerships with the NASA centers

- Synopsis was released on July 17. NASA will determine next steps based on industry response.

Summary

- Commercial cargo is demonstrating ISS cargo resupply capability.
- Commercial crew is continuing to advance commercial crew transportation system designs. Significant maturation expected over the next year.
- Collaborations Synopsis may provide an additional partnering opportunity for U.S. private industry.
- Technical, schedule, and budgetary challenges remain for NASA's commercial spaceflight initiatives. However, progress is being made.
- Together with NASA's deep space activities (i.e., Space Launch System and Orion capsule), NASA's human spaceflight program is robust and moving forward.