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**Statement of  
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National Aeronautics and Space Administration**

**before the**

**House Science, Space, and Technology Committee  
U.S. House of Representatives**

Mr. Chairman and Members of the Committee, thank you for the opportunity to appear before you today to discuss the newest phase of NASA's Commercial Crew Program (CCP). We are committed to launching our crew from U.S. soil on spacecraft built by American companies as soon as possible. This program is good for NASA, the American taxpayer, and the U.S. economy. American commercial crew transportation and emergency return services will enable the United States to fly its own astronauts to and from the International Space Station (ISS), end our sole reliance on foreign governments, increase the ISS crew complement to 7 from 6, enable increased ISS research utilization, and allow NASA to focus on deep space exploration. The ISS is a tremendous national resource and having dissimilar redundancy in crew transportation is critical to effective utilization of ISS. Cargo transportation has dissimilar redundancy with four independent systems capable of ISS cargo resupply (Progress, ATV, HTV, and Dragon). For ISS crew transportation, we have only a single system – the Soyuz. Lastly, the providers of these crew transportation services will also be able to market their low-Earth orbit transportation services to other non-NASA customers, thus improving the U.S. position in commercial space launch services.

NASA is very pleased with the progress our commercial space industry partners have made and continue to make in the development of crew and cargo transportation systems to date. SpaceX's demonstration flight to the Station in May 2012 achieved all of its test objectives enabling regular cargo resupply missions to be performed to the ISS. Moreover, the mission was completed at significantly less cost to the American taxpayers than if we had pursued a traditional, cost-plus development contract approach, and provides further confidence in our commercial space transportation strategy. Orbital Sciences is following close behind, with test flights of its Antares rocket and Cygnus cargo spacecraft and their own demonstration mission to the Station planned in the months ahead. In the Commercial Crew Program, our four funded CCDev 2 partners Blue Origin, Sierra Nevada Corporation, SpaceX and Boeing, and our three unfunded partners United Launch Alliance, ATK and Excalibur Almaz, have successfully

completed almost all of the planned milestones, with only four remaining to be accomplished by the end of the year. These milestones included major risk-reduction testing such as engine firings, parachute drop tests, astronaut evaluations, and wind tunnel tests, in addition to numerous technical design and safety reviews.

On August 3<sup>rd</sup>, NASA announced three new agreements with American commercial companies to design and develop the next generation of U.S. human spaceflight capabilities. Known as Commercial Crew Integrated Capability, or “CCiCap,” these newly signed agreements will enable advances that are intended to ultimately lead to the availability of commercial human spaceflight services for government and commercial customers.

Under CCiCap, industry partners will advance the integrated critical design of their planned crew transportation systems, including the crew spacecraft, launch vehicle, ground systems, and mission control capabilities. The agreements commence with a 21 month base period that will run from August 2012 through May 2014, which includes completing major design efforts and risk reduction demonstrations, propulsion testing, abort tests, and landing tests. This 21 month period will lead to approximately a critical design review level of maturity for two of these companies. The agreements also include proposed optional milestones beyond the base period, which NASA may fund incrementally, as needed. The information provided in support of these optional milestones will be important to improving our cost models for development under this new system of acquisition.

The companies selected for CCiCap agreements are:

- The Sierra Nevada Corporation, of Louisville, Colorado
- Space Exploration Technologies (SpaceX), of Hawthorne, California, and
- The Boeing Company, of Houston, Texas

Sierra Nevada will continue maturing their Dream Chaser spacecraft to be launched on an Atlas V rocket, while focusing on safety analysis and subsystem technology maturation/risk-reduction. The Dream Chaser is a reusable, piloted lifting body, derived from NASA’s HL-20 concept. It will glide to landings on a runway, similar to the Space Shuttle. Their agreement includes nine base period milestones, and is worth \$212.5 million if all milestones are accomplished. Notable milestones include further atmospheric flight testing of the Dream Chaser engineering test article, two integrated system safety analyses, wind tunnel testing, and propulsion systems testing.

SpaceX is maturing its Falcon 9/Dragon transportation system, focusing on developing an integrated, side-mounted launch abort system and other crew systems. The un-crewed version of the Dragon capsule has already been demonstrated as part of the Commercial Orbital Transportation System (COTS) program, and will be used operationally as part of the ISS cargo

resupply services effort beginning later this year. However, changes will be required for the cargo version to meet the requirements necessary to carry crew. The crewed version of the Dragon will land on land. SpaceX's fourteen base period milestones are valued at \$440 million, and include pad and in-flight abort flight tests, primary structure qualification, and an integrated system critical design review.

Boeing will continue developing its "CST-100" crew spacecraft, to be launched on an Atlas V initially, but capable of launching on other rockets. The CST-100 is a capsule-based spacecraft that leverages proven flight components. It will be reusable for up to ten missions and utilize airbags to enable land-based landings. Boeing's agreement includes \$460 million for nineteen base period milestones including wind tunnel testing, a production design review, propulsion systems testing, a pilot-in-the-loop demonstration, and an integrated system critical design review.

NASA is confident that these agreements for CCIcap will provide a cost-effective approach by which the partners can be innovative, creative, safe, and flexible in their design solutions to develop a commercial LEO crew transportation capability, while still maintaining competition for future stages of the program.

### **Overall Commercial Crew Program Strategy**

NASA has a two-fold strategy to end the United States' sole reliance on foreign crew transportation to the International Space Station and utilize a safe, cost-effective U.S. Crew Transportation System (CTS) as soon as we are able to certify those systems to carry NASA astronauts.

- NASA is using Space Act Agreements under the CCIcap phase to support the design and development of commercial crew transportation capabilities, as outlined above.
- NASA will use FAR-based contracts for the certification of commercially developed capabilities and for the procurement of crew transportation services to and from the ISS to meet NASA requirements.

NASA is committed to ensuring that the requirements, standards, and processes for CTS certification for all commercial missions are held to the same or equivalent safety standards as Government human spaceflight missions. NASA certification will cover all aspects of a crew transportation system, including: development, test, evaluation, and verification; program management and control; flight readiness certification; launch, landing, recovery, and mission operations; sustaining engineering, and maintenance/upgrades. To ensure NASA crew safety, NASA certification will validate technical and performance requirements, verify compliance with requirements at the subsystem, process, and safety levels, validate that the CTS operates in the appropriate environments, and quantify residual risks.

NASA has determined that FAR-based contracts are needed for ISS service missions and has decided to begin the initial certification efforts immediately to enable the earliest possible crew transportation. If NASA were to delay certification activities, the development of industry's capabilities could eventually reach the point where any changes necessary to meet NASA requirements would not be technically feasible or affordable, potentially extending our reliance on foreign systems.

To mitigate these risks, NASA is moving forward immediately with plans to compete and award 2-4 FAR-based fixed-price contracts in CTS Certification Phase 1 that will begin early NASA-managed certification activities. These contracts are referred to as Certification Products Contract(s) (CPCs). The deliverables will include early life-cycle certification products (alternate standards, hazards analysis, and verification, validation, and certification plans). The period of performance will be approximately 15 months, with an expected award date in February 2013. CPC awards will not exceed \$10 million per award.

At the conclusion of the CPC, NASA anticipates that more than one commercial provider will have achieved the technical maturity of an integrated critical design state to enable a Phase 2 competition for the CTS Certification Contract. A separate, formal solicitation (RFP) will be released for the Phase 2 Certification Contract. Under NASA's planned strategy, the Phase 2 CTS Certification Contract will include development, test, evaluation, and certification activities enabling NASA to assess the CTS capability for performing ISS missions in compliance with NASA requirements to ensure NASA CCP mission and safety objectives are achieved. To provide an incentive to any commercial provider who is successful in achieving CTS Certification, the Phase 2 contract will include, as options, a nominal number of crewed missions to the ISS following successful CTS Certification. NASA believes that having more than one contractor through Phase 2 would provide significant advantages for insuring safe and affordable CTS through competition. The ultimate number of awards will be driven by technical maturity, funding availability, and mission needs. An acquisition strategy white paper has been developed that lays out the strategy for these procurement activities. The whitepaper can be accessed from the Commercial Crew Program website (<http://commercialcrew.nasa.gov/>) under the "Program Forum" link.

Phase 2 Certification activities will then lead to a competitive acquisition for the provision of commercial ISS transportation services using FAR-based, fixed-price contracts, similar to the manner in which NASA has contracted for commercial cargo services. Based on the information the Agency has received to date and assuming reasonable budget levels and technical progress, we believe that this acquisition strategy can enable services beginning in the 2017 timeframe. This estimate takes into consideration not only the schedule plans of our current industry partners, but also the NASA certification work described above. Beginning CCIcap now, and awarding the CPCs by early 2013, will ensure we stay on track for achieving the 2017 goal. We recognize that some of the industry providers are aiming at a service date earlier than 2017 and we will be able to take advantage of an earlier date if it occurs.

## Conclusion

Following the example of many successful industries in the past, the United States is now entering a new era in spaceflight that harnesses the innovation and ingenuity of the private sector. This capability will provide cargo and crew access to LEO, while NASA once again pushes the boundaries of human exploration. The ISS has now entered its intensive research phase, and this phase will continue through at least 2020. In order to realize the promise of this facility, NASA will be relying on U.S. industry to provide cargo resupply, return and disposal services, as well as crew transportation and emergency return services. While there are still challenges ahead, the recent success of the SpaceX COTS demonstration mission is a harbinger of the potential of procuring transportation services from private entities.

Human spaceflight is a very difficult endeavor and achieving routine commercial crew transportation is a challenge, but NASA is structuring an approach that provides the highest probability of success. NASA's current path is a solid approach for developing and acquiring crew transportation services in a manner that is cost-effective and provides for crew safety. Procuring commercial crew transportation services from U.S. industry will allow NASA to focus its resources on the development of vehicles that will take our astronauts beyond LEO for the first time since 1972, furthering the legacy of the late Neil Armstrong and building on the incredible recent successful landing of the Mars Science Laboratory *Curiosity* rover on the surface of Mars. Support to this activity is also critical to ISS, which is key to the future of human spaceflight. ISS not only can provide research valuable to the people of the earth, but is also needed for NASA to reduce the risks associated with astronauts travelling for extended times beyond low Earth orbit.

Mr. Chairman, I would be happy to respond to any question you or the other Members of the Committee may have.