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July 16, 2014

Statement of
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before the

Committee on Commerce, Science, and Transportation
U. S. Senate

and the

Subcommittee on Strategic Forces
Committee on Armed Services
U.S. Senate

Mr. Chairman, thank you for this opportunity to testify before you on NASA's plans for access to space. NASA's requirements for access to space are driven by the Agency's broader goal to expand the frontiers of science and human exploration of space. As part of the overall strategy to meet this goal, and consistent with the national consensus described by the NASA Authorization Act of 2010, the Agency is pursuing a stepping-stone approach to the human exploration of space leading to human missions to Mars in the 2030s. As key steps along this path to Mars, NASA will continue research aboard the International Space Station (ISS), develop the Space Launch System (SLS) and *Orion* crew vehicle, and test our new capabilities in the proving ground of cis-lunar space.

As a critical element in this long-term exploration strategy, and also supported by existing policy and law, expanding commercial access to low-Earth orbit (LEO) and commercial, exploration, and scientific utilization of the ISS remain among NASA's highest priorities. With the Administration's commitment to the extension of ISS operations through 2024, NASA looks forward to expanded research opportunities and commercial transportation of both cargo and crew to and from ISS. Currently, two American companies are launching cargo to the ISS from U.S. soil. This summer, NASA will complete a commercial crew competition and we will select one or more commercial companies to develop the capability to launch American astronauts from American soil by the end of 2017. Competition is a key to controlling costs over the long-term as well as to improving the level of safety and NASA will seek to maintain competition to the degree feasible.

NASA is developing the next generation of scientific missions in pursuit of our Nation's space and Earth science goals. Through FY 2020, NASA has plans to launch over 18 science missions of various size classes on a variety of launch vehicles.

Space Access Beyond Low-Earth Orbit

The Space Launch System (SLS) is an exploration-class, heavy-lift launch vehicle that will transport the *Orion* crew vehicle, as well as cargo and other systems, and is uniquely designed for missions beyond

LEO. SLS will begin with a lift capability of 70 metric tons, evolving to 105 metric tons and eventually up to 130 metric tons, based on future mission requirements. The evolution of the SLS lift capability fulfills specific, important roles within the Nation's and the emerging global exploration architecture, enabling human exploration missions to Mars and similarly challenging expeditions.

Our analysis indicates that near-term human exploration missions will benefit most from increased "in-space" performance from an enhanced upper stage. Increased booster thrust performance will further supplement that capability, but it is not required until NASA undertakes human missions to even more challenging deep-space destinations such as the surface of Mars. NASA is committed to evolving the SLS vehicle system capability with an enhanced upper stage and/or advanced booster (solid or liquid) in the future, but our current needs do not require funding for a new liquid-oxygen/hydrocarbon booster engine risk reduction or development effort at this time. We plan to use our remaining risk reduction funding in FY 2015 and beyond to conduct enhanced liquid hydrogen fueled upper stage work. The results of our investments in risk reduction will be available to, and can be leveraged by, other interested Government organizations.

Although NASA's expected mission needs do not require a new booster engine at this time, we will monitor the development actions of our sister agencies to understand how their work could support future NASA requirements. We continue to work with DOD to assess the overall U.S. launch posture and are reviewing how NASA's unique facilities and expertise and experience might best contribute to future development efforts.

Access to the International Space Station

Under NASA's Commercial Resupply Services (CRS) contracts, Space Exploration Technologies (SpaceX) has been selected to provide 12 cargo flights to the ISS, and Orbital Sciences Corporation (Orbital) has been selected to provide 8 flights. Counting demonstration flights and CRS resupply flights, SpaceX has now completed three cargo missions to the ISS, successfully delivering cargo and returning scientific samples to Earth, with the fourth mission expected to launch in the third quarter of this year. Orbital Sciences Corporation has completed their demonstration mission to the ISS and their first contract mission under CRS to deliver crew supplies, research and other cargo onboard the *Cygnus* spacecraft. Orbital launched its second ISS resupply mission just last week. NASA continues to work with its commercial partners to develop a U.S. commercial capability for human spaceflight, and remains committed to its goal of launching American astronauts from U.S. soil by the end of 2017. 2014 will be a pivotal year for NASA's Commercial Crew Program (CCP), as the Agency is preparing to announce one or more awards in August/September for Commercial Crew Transportation Capability (CCtCap) contracts that will include operational crewed flights to the ISS. In addition to helping NASA meet mission requirements, a number of lessons learned and other experiences are being gained through these public-private ventures.

Space Access for Other NASA and National Missions

NASA's Launch Services Program (LSP) within the Human Exploration and Operations Mission Directorate supports the Agency's diverse scientific mission portfolio by working diligently to match spacecraft with the right industry launch vehicles for optimal mission success and Government efficiency.

NASA Launch Services (NLS) contracts are the primary contractual mechanisms LSP uses to acquire commercial launch services to place NASA-owned and NASA-sponsored robotic missions, payloads, and/or spacecraft into orbit. The current series of NASA Launch Service contracts, known as NLS II

contracts, are Firm Fixed Price, Indefinite Delivery/Indefinite Quantity, Federal Acquisition Regulation (FAR) Part 12 type contracts. NLS II has an ordering period through June 2020, with a period of performance through December 2022. In order to compete for task orders to launch NASA science payloads, commercial launch service companies must first be qualified to receive a contract under NLS II. Task orders are competed across the NLS II contract holders for the launch of a specific NASA mission.

NASA has in its portfolio a variety of domestic launch vehicles which will carry out various missions launching new and exciting payloads to study the Earth and the solar system, all the while maintaining our state-of-the-art Space Communications and Navigation network. The portfolio of rockets available to the Agency through the NASA Launch Services contract managed by LSP includes the United-Launch-Alliance-provided *Atlas V* and *Delta II*; the SpaceX provided *Falcon 9 v1.1*; the Orbital-provided *Antares 120*, *Antares 130*, *Minotaur-C* (formerly known as the *Taurus XL*) and *Pegasus XL*; and the Lockheed Martin *Athena IIc* and *Athena Ic*. In addition, LSP anticipates that our commercial launch service providers will add additional launch vehicles (such as the *Delta IV* and the *Delta IV Heavy*) and new launch vehicles (such as the *Falcon Heavy*) to our NASA Launch Services contracts at some point in the near future so those commercial launch services can compete to launch NASA's missions.

Future Booster Engine Requirements

Recent geopolitical events have highlighted the dependence of some U.S. launch vehicles upon Russian-supplied RD-180 liquid oxygen/hydrocarbon engines. However, NASA anticipates that available alternative launch vehicles could effectively substitute for NASA launches now planned utilizing the RD-180 engine, and is working with our Department of Defense partners to assess all manifest options and cost impacts should that become necessary.

As has been described above, NASA does not have a current requirement for a liquid-oxygen/hydrocarbon engine in support of the SLS now in development at this time. With respect to CRS for the ISS, CCP, and LSP supporting the launch of our Agency and other civil-sector satellites, NASA expects commercial providers to propose and provide launch solutions that are consistent with national policy, and for our commercial cargo and satellite launch service providers to meet their contractual commitments.

NASA currently plans to launch payloads on six commercially provided *Atlas V* rockets which rely on Russian supplied RD-180 engines. Should the supply of these engines be disrupted, an inter-agency discussion would be required in order to allocate the available remaining RD-180 engines among national security and NASA missions. Other launch vehicles would need to be considered using appropriate procurement procedures, which would add time to the launch process. This process would entail significant fiscal impacts caused by the program delays required in order to make the necessary mission-to-launch vehicle assignment changes. However, any Government-funded program to develop an engine to replace the RD-180 would also require a substantial investment of funds over a significant period of time. NASA will advise DOD efforts to initiate rocket engine risk reduction activities that could lead to a possible development effort. NASA will also continue to work with the DOD on ongoing strategic assessments of the overall U.S. space propulsion and transportation industrial base and believes such assessments should be completed before any decision is made to fund a new engine. This includes considering approaches that could concentrate on improving current system production rates and reduce per unit costs while maintaining high reliability and increasing competition, as well as considering the significant investments that the Nation has made (and the international leadership we have carefully developed and maintained) over the past several decades in key propulsion technologies, such as liquid hydrogen and solid propulsion.

In summary, NASA relies on an array of vehicles to access space. The Agency is developing a uniquely capable heavy-lift launch vehicle, has contracts with commercial partners for cargo services in support of the ISS, is working with commercial partners to develop a commercially-provided crew capability for LEO, and has contracts with commercial providers for the launch of scientific and other civil payloads. NASA recognizes the threat posed by a potential disruption in the supply of the RD-180 engine and we are moving forward to work with other Government agencies on options to address this threat. We continue to work with the DOD as it assesses approaches that could increase production rates and potentially reduce costs for launch systems that do not rely on the RD-180 engine. Mr. Chairman, thank you for the opportunity to appear before you today. I would be happy to respond to any questions you may have.