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Statement of
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Aerospace Safety and Advisory Panel

Before the

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

Senator Hickenlooper and Members of the Subcommittee, thank you for the opportunity to appear before you today to discuss NASA's international collaboration and competition in space.

As you know, the Aerospace Safety Advisory Panel is charged with advising both the NASA Administrator and the Congress with respect to the safety and risk of human space flight as well as other safety related matters at the Agency. In opening, I would like to emphasize that the Panel feels the responsibility to provide advice that promotes the driving down of risk to the lowest reasonable level consistent with accomplishing the mission. Space exploration is inherently dangerous; the environment is hostile, and the systems needed to survive in it are complex. Our charge is not to avoid any and all risks, but to provide advice and feedback for the intelligent management of those risks.

NASA has been at the forefront of human space flight for decades, and for much of that time it executed the programs, formulated the missions, defined the requirements, and performed management integration of all the elements composing the system. NASA personnel performed the engineering analyses, and they led launch processing and mission operations.

NASA leadership in human space exploration is still preeminent, but the Agency's role is evolving with critical implications for how risk and safety will be managed in the future. The Agency is not the same as it was ten years ago, and most assuredly, it will not be the same in another ten years—even five years—from now. With the rapid growth of available commercial space services, and increasing global interest in space, the environment in which NASA operates has changed; NASA will not return to a landscape in which it is the only, or even the major, actor. These developments have tremendous upside potential—and are accompanied by equally tremendous challenges for managing the risk of human space exploration. Concurrently, the human exploration endeavors NASA is leading are becoming ever more complex, and with more risk, from the lunar exploration to eventual excursions to Mars and beyond.

Over the past several years, NASA has been adjusting to a changing role and set of responsibilities as it shifts from principally executing its programs and missions to commercially acquiring significant key elements and services. The Agency has gradually and tactically adapted and succeeded in meeting challenges as they arise. Regardless of their tactical achievements to date, the Panel firmly believes that it is critical at this time that NASA take more strategic scrutiny of the role the Agency should undertake going forward. How the Agency plans to evolve and transition to an organization that more frequently procures human space flight capabilities as services, while managing a safe and wholly new human exploration campaign, is a key strategic question that has the Panel's attention. We continue to emphasize the importance for NASA to strategically define its mission, its guiding principles, and its vision for the Agency's leadership role in the future in order to ensure that risk is managed appropriately.

The emerging challenges for NASA involve the melding of traditional and innovative program approaches, including the significant systems engineering and integration complexities, and the certification of commercial human space flight capabilities that carry high levels of risk. The Panel has noted clear advantages to leveraging the industry innovators, but NASA must still manage and be responsible for the overall risks, even when the Agency does not control nor dictate the material solutions for some of the campaign components and services, such as the Human Landing System. It is critical for NASA to be able to manage the integrated risk and achieve the right balance with its providers.

To do this, first, the Panel believes that NASA needs to figure out how to exercise appropriate accountability—or how to hold its vendors accountable—for the safe and successful accomplishment of its mission across the full spectrum of acquisition and development approaches. As the breadth and types of relationships develop, expand, and become more complex to achieve NASA's mission safely, and with good understanding of the risk involved, it is critical for the Agency to have and to use the appropriate tools including acquisition processes and contractual structures. There is not a one-size-fits-all approach anymore, and having an overarching view of what the Agency is trying to achieve should lead to a flexible and thoughtful deployment of the tools in the toolbox.

Secondly, the Panel believes it is imperative to define the overall architecture for the highly complex Artemis mission sets. The Agency should identify how each individual element—regardless of provider—fits the architecture, and define the top-level requirements that must be met in order to for the element to fulfill its necessary function in the overall mission structure. This work can then form the foundation for the system engineering and integration. The complexity of the Artemis ecosystem, along with the expected evolution of requirements—which involves creating and maintaining an architecture that can be updated, adjusted, and can incorporate the latest innovation or new technology—can more effectively be managed by an integrated approach best achieved in a program construct. This should allow NASA as a whole to focus on the right set of priorities at the right time and to communicate expectations to all the contributors—internal, commercial, and international—in a consistent manner. In addition, all players understanding enterprise-level requirements, organized in a program construct, early in the process helps to identify opportunities and areas to pursue open architecture paradigms and reduce expensive, complicated, and bureaucratically burdensome design and contractual changes later.

Thirdly, I note that NASA's approach is complicated by the nation's current lack of a comprehensive regulatory framework for human commercial spaceflight. Presently, NASA retains full accountability, but no external government regulations or rules exist, which may help the Agency manage risk, or even set a baseline level of expectation for the provider, related to human occupant safety. There are some regulatory pieces in place. At the highest level is the Outer Space Treaty. The Federal Aviation Administration is responsible for licensing commercial launches and reentries, with a specific focus on the safety of the uninvolved public on the ground. The Federal Communications Commission is responsible for licensing radio broadcasts from space. The National Oceanic and Atmospheric Administration is responsible for licensing remote sensing operations. NASA and the Department of Defense are key players in space, but they are not regulatory agencies. That leaves a gap in authority specifically related to on-orbit safety, both for humans and the management of an increasingly more active satellite industry that will eventually impact human safety. Given the importance of space to national security, technological leadership and international competitiveness, our Panel believes it is vital for the United States to act now to preserve the safety of space operations and the safety of the environment. Consequently, I would be remiss if I did not repeat a standing Panel recommendation to the Congress. We feel very strongly that there is an immediate and compelling need to designate a civil agency to oversee and coordinate space traffic management. NASA, lacking any other framework, has established guidelines and standards for space traffic management, but there must be leadership and coordination at the national level

Finally, I would like to reiterate some consistent advice themes from the Panel:

- First, we have consistently maintained that mission success requires a constancy of purpose, a sustained commitment, and a clear understanding of objectives.
- Second, a key issue, repeated year after year, is the importance of setting challenging but achievable schedules, and not allowing undue schedule pressure to lead to decisions that adversely impact safety and mission assurance.
- Third, it is important to establish technical baselines and schedules that are mutually consistent, realistic, and achievable—supported by adequate and stable resources.
- And, we have continuously maintained that while NASA should never lose sight of the fundamentals in risk management for successful program execution, there is no one approach that dictates success, and there should be an openness to learning and accepting alternative means to understanding and controlling margins.

So, as NASA continues its deep space exploration, we encourage the Agency, in partnership with the Congress, to hold fast to the foundational standards of risk management while embracing new approaches and not fear alternative methodologies to achieving those fundamentals.

Thank you. I look forward to your questions.