U.S. SENATE COMMITTEE ON
COMMERCE, SCIENCE & TRANSPORTATION

Given at a Science, Technology, and Space
Hearing: **Space Shuttle and the Future of Space Launch Vehicles**
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The Testimony of

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Mr. Chairman and members of the Committee, thank you for the invitation to appear before you to discuss future launch options for the Nation's human space flight program. ATK applauds the President for articulating a vision for the Nation's space exploration program and fully supports its implementation. ATK is proud of its participation in the Space Shuttle program and looks forward to our continued involvement in human and robotic missions.

In my career I have had the privilege to participate in many NASA programs and have experienced first hand the excitement that comes with technical achievements and mission success. This success is what fuels our imagination, motivates us to advance technology and gives us confidence to meet future challenges.

There are three points I would like to cover on why the Space Shuttle system is vital to continued U.S. human access to space and why derivatives of this system can be the key enabler to achieve the objectives of the space exploration vision.

The first step to achieve the space exploration vision is to continue the U.S. presence in space by returning the Shuttle to flight and completing construction of the International Space Station (ISS). We recognize the need to finish the ISS, allowing space science to continue and enabling future human space science and exploration. The Space Shuttle is critical in completing the ISS assembly, and we look forward to returning the Shuttle to flight as soon as it is safe to do so. Second, we recognize the importance of U.S. space policy that supports a mixed fleet of launch vehicles. Following this policy will maintain the integrity of the industrial base and assure access to space. The unique capabilities of the existing fleet of Shuttle, EELV's and commercial launch vehicles have served us well in the past, and may offer advantages where they can best serve exploration safely and affordably. The focus and the resources for space exploration should be applied to building exploration capability and hardware that will be needed in order to travel to and function on the Moon and Mars, getting there and back, and going beyond, not spent on something that already can be done – getting cargo and humans to low earth orbit. Which brings me to my third and primary point.

We recognize there are numerous studies on how to put exploration payloads (CEV or heavy) into orbit in an affordable and sustainable manner. We are working with our industry partners to provide options that utilize the unique capabilities of the Shuttle infrastructure. This can offer tremendous advantages. By replacing the orbiter with a cargo-carrying module and using components of the Shuttle propulsion system, a wide spectrum of capabilities that are sustainable and affordable can be offered; Multiple missions – common hardware. Most of which are already in place and flight proven.

For heavy lift, by attaching a cargo carrier to the external tank and using some of the

existing capabilities, such as boosters, engines, launch pad, skills, etc. – we can launch a heavy payload – 150K lbs to orbit, which is three times the current capability. Since everything except the cargo carrier is already in operation, the cost to develop and fly this system is substantially reduced. In fact, this heavy lift system could even start flying before the Shuttle program ends - sharing common hardware, systems, and trained people. This would make it even more cost effective.

In later years, if payload requirements grow, an advantageous spiral development approach exists to meet future needs. The flexibility is in place to use longer boosters like the 5-segment Shuttle motor tested last October, and a longer fuel tank to launch almost 200K lbs to orbit, or an in-line configuration that could approach 225K lbs.

On a smaller scale – the crew exploration vehicle program plan shows demonstrator flights as early as 2008, and unmanned vehicle flights by 2011. Since this vehicle will probably only weigh 35-40K lbs, the heavy lift configuration may not be required. In keeping with the approach of maximizing use of common hardware and proven infrastructure so costs and risks can be minimized, and safety and reliability maximized, a Shuttle-derived solution should also be considered.

A human rated and flight proven CEV launch system can be available by simply utilizing a single booster combined with a liquid engine second stage. This configuration would use the same infrastructure, launch pad and people as the heavy lift transportation system. Additionally, if there is a 35-40K lb payload/cargo requirement instead of the CEV, the same system could be used – further improving overall cost effectiveness.

By leveraging what has been invested over the past 20 years in people, systems, production and processing facilities, and also the knowledge and experience gained on these human rated elements an exploration transportation system can be structured that minimizes risk and cost, while maximizing safety and reliability. Strong consideration should be given to an exploration transportation system that is derived from this experience base, and maximizes use of demonstrated common hardware and infrastructure. And by replacing the orbiter with a cargo carrier or CEV, operating costs will be reduced. We recognize that EELV and commercial options are also being reviewed, and know they can play a role, but for heavy lift and human lift (CEV), the demonstrated reliability and use of existing Shuttle derived elements offer a low risk and cost effective approach.

The Shuttle program embodies a significant national resource of people (engineers, technicians, and leaders), hardware, facilities and tooling. The program has benefited from the growing and learning that comes with human space flight experience. If this knowledge and capability can be utilized, the drive for science and exploration can proceed with confidence and minimize the cost and schedule impacts that come with developing new launch systems.

In summary, the Shuttle program not only plays a vital role in completing the ISS and starting our progress toward exploration, but elements of the program may also serve as the building blocks for the exploration transportation system of tomorrow. The benefits of using these demonstrated, well understood elements, with common infrastructure across different exploration missions will give the program the foundation and confidence to meet the cost and schedule targets laid out by the President. In fact, the benefits to safety should not go without notice either – not just because these systems were designed and maintained over the years to be human-rated, but the workforce in place today supporting the Space Shuttle,

knowing their efforts will evolve instead of end, will be a tremendous motivation and source of security that will only help to enhance the focus on safety. Investments in the existing infrastructure will also have better long-term utilization.

A propulsion system derived from the Shuttle will allow maximum attention and resources to be applied to the challenging elements of the exploration missions – living on the moon, going to Mars, and other things that have not been done. The elements of this propulsion system are already in operation, demonstrated, and fully capable to meet the safety, cost, schedule and growth needs of tomorrow.

Thank you for the opportunity to share my thoughts with you, I will be pleased to respond to any questions that you may have.