

## **Re: The Importance of Growing Artificial Intelligence in Space Exploration By Astrobotic Technology, Inc.**

Chair, Members of the Committee:

Thank you for the opportunity to submit this written testimony on behalf of Astrobotic Technology, a U.S.-based space robotics company headquartered in Pittsburgh, Pennsylvania. Astrobotic is committed to advancing America's leadership in space through innovative technologies that support sustainable exploration of the Moon, Mars, and beyond.

**Artificial Intelligence (AI)** is a transformative enabler for space exploration. AI empowers spacecraft, landers, and rovers to perform autonomously, efficiently, and safely in remote and extreme environments. From real-time decision-making to hazard avoidance and intelligent data prioritization, AI is becoming as essential to deep space exploration as propulsion systems and communications infrastructure.

### **AI in Space Operates at the Edge**

Space is an inherently constrained environment. Communication bandwidth is limited, response times from Earth are delayed, and onboard computing resources must be radiation-hardened and robust. AI addresses these constraints by bringing intelligence directly to the edge: onboard spacecraft, landers, and rovers operating millions of miles from Earth, where they must make their own decisions.

Onboard AI enables:

- **Prioritization of Critical Data:** This capability is especially valuable for missions constrained by limited bandwidth and power. AI can rapidly process raw sensor data into actionable insights, enabling timely decisions that would otherwise be delayed. For example, it can enhance wildfire detection, accelerate climate monitoring, and unlock new commercial opportunities by delivering critical information fast enough to drive immediate response and impact.
- **Improved Autonomy and Mission Productivity:** In high-latency environments like the Moon or Mars, robotic systems must react in real-time to unpredictable situations, whether avoiding a hazard or responding to a system anomaly. AI enables autonomous navigation, dynamic decision-making, and intelligent fault response, reducing the burden on Earth-based operators and increasing mission cadence and success rates. Historically, spacecraft have used long lists of hand-coded responses to tackle expected problems or opportunities that are expected to arise. However, this approach struggles with unanticipated situations, which will only become more common as new missions and capabilities are proven every year in space. AI enables a greater degree of flexibility and robustness as spacecraft tackle new missions like producing resources on other planetary bodies or assembling power grids in space.
- **Support for Human-Robotic Collaboration:** As we move toward a future of combined human and robotic activity on the Moon and Mars, AI will be essential for creating systems that support astronaut health, safety, and productivity in real time. Similar to autonomous vehicle

technology on Earth, space-based AI can take on routine operations, monitor system performance, and serve as a fail-saf—stepping in when humans are resting or when quick, corrective action is needed. This synergy between human judgment and machine precision will be vital to the success of long-duration missions.

## AI at Astrobotic: Real-World Applications

Astrobotic is integrating AI into multiple aspects of our lunar missions and robotics platforms. Two key applications include:

1. **CubeRover Mission 1: Immersive Rover Feedback**

Launching later this year aboard Astrobotic’s Griffin lander to the lunar south pole, CubeRover Mission 1 will demonstrate AI-enhanced operations on the lunar surface. An onboard AI system will process rover telemetry and sensor data to deliver immersive, high-relevance feedback to operators at Astrobotic’s Pittsburgh-based mission control center. The AI will prioritize critical information, improving situational awareness and operational decision-making in real-time.

2. **AI for Safe and Precise Lunar Landing**

Lunar landings are among the most complex operations in space. Unlike Earth, the Moon lacks GPS or other global navigation aids. Astrobotic is developing AI-powered perception and guidance systems to enable spacecraft to autonomously identify hazards, such as craters or boulders, during descent and land with high precision. These systems rely on neural networks trained to interpret lunar terrain using camera feeds, LiDAR scans, and onboard maps, echoing the judgment used by Neil Armstrong to land Apollo 11, but with autonomous precision.

## Compute Is Key: Hardware for AI in Space

AI’s success depends not only on algorithms but also on the ability to run them in space. Conventional computer processors cannot survive radiation and thermal extremes found in space environments. Astrobotic is developing next-generation space computing platforms that are ruggedized, compact, and optimized to run advanced AI workloads onboard landers, orbiters, and rovers. This technology is essential for unlocking the full potential of space-based AI and other high-performance space computing applications relevant to national security and planetary exploration.

## Looking Forward

Artificial Intelligence is not a speculative future technology—it is a present-day requirement for sustainable space operations. As the United States maintains national security, executes the **NASA Moon to Mars strategy**, and continues to fight for US leadership in the space domain, we must equip our missions with the tools to operate safely, autonomously, and efficiently. AI is that tool.

Astrobotic believes AI will be a cornerstone of future exploration, enabling:

- Sustainable human presence on the Moon

- Robotic infrastructure development (e.g., power grids, mobility systems, construction)
- High-frequency, high-efficiency mission operations
- Real-time science and discovery
- Enhanced safety and reduced mission cost

We respectfully urge continued support for AI research and its integration into spaceflight systems, especially through public-private partnerships, mission demonstrations, and technology development programs.

Astrobotic stands ready to support these efforts and to lead alongside NASA and our industry partners in building the infrastructure for a new era of American space exploration.

Thank you for your attention and the opportunity to contribute to this important dialogue.