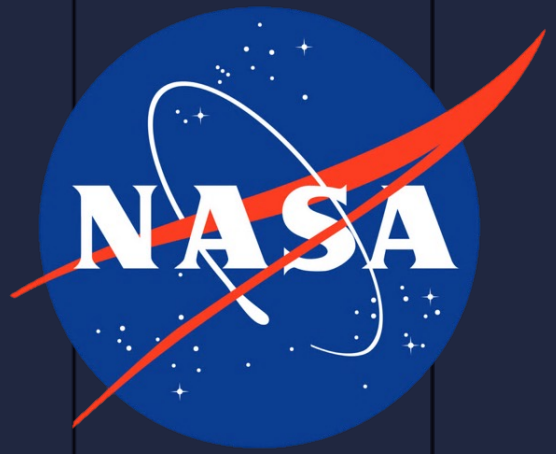
Advanced Suit Team
NASA JSC – EC5

ICES-2024-300

NASA Advanced Space Suit Pressure Garment System

Status and Development Priorities 2024



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DATE
July 2024

CONTRIBUTORS
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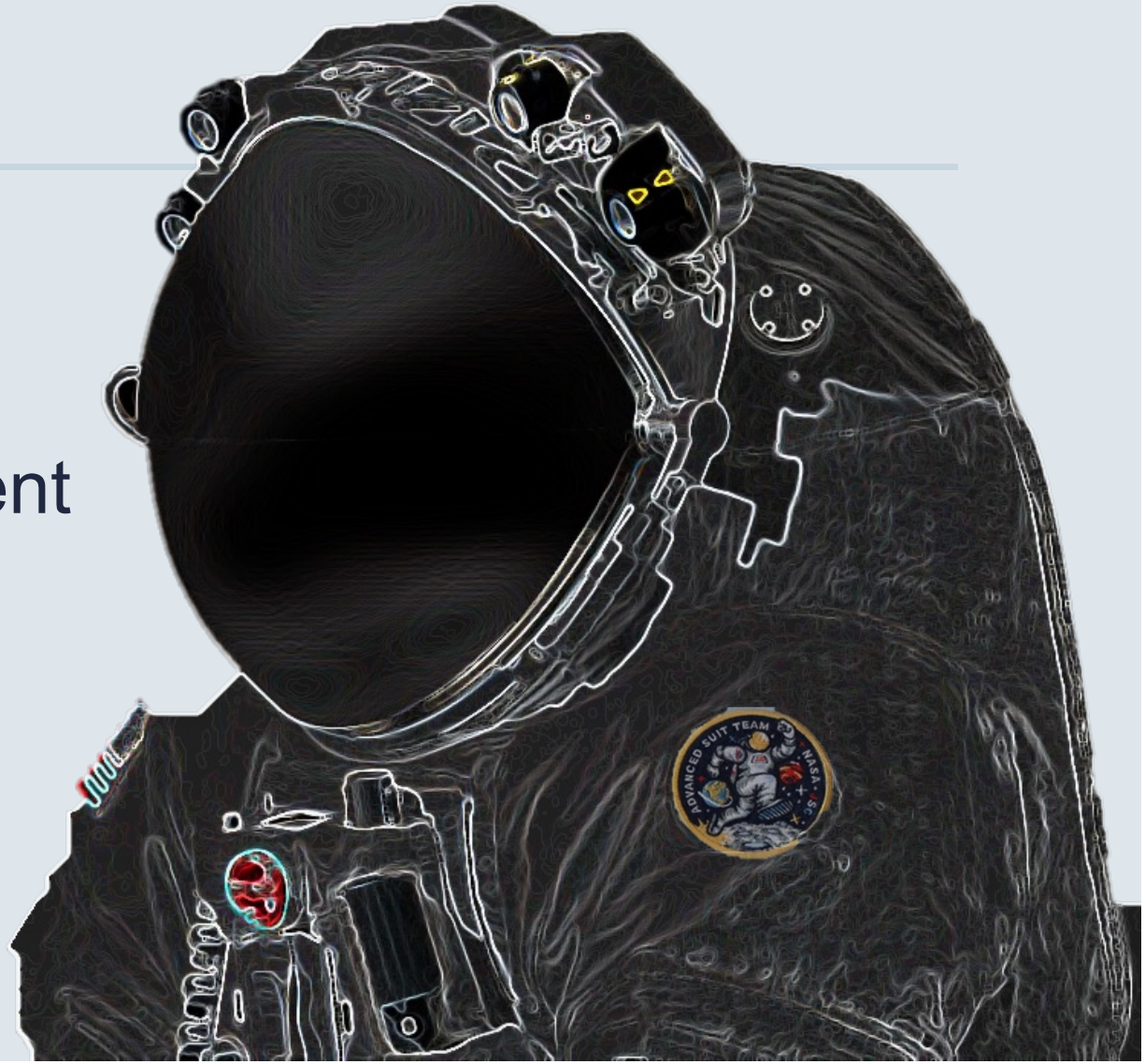
Donald Campbell

PREPARED BY
Shane McFarland

- Introduction
- Commercial suit vendor development
- Testing and integration
- Technology Development



Introduction

- Evolution of xEMU
- Evolution of Advanced Suit Team
  - 30 engineers, designers, and technicians
- Three primary team roles
  - xEVAS vendor insight and support
  - Testing for infrastructure, interfaces, tools, integration and training
  - Technology development to enable the next generations of EVA

xEVAS

NASA Partners with Industry for New Spacewalking, Moonwalking Services

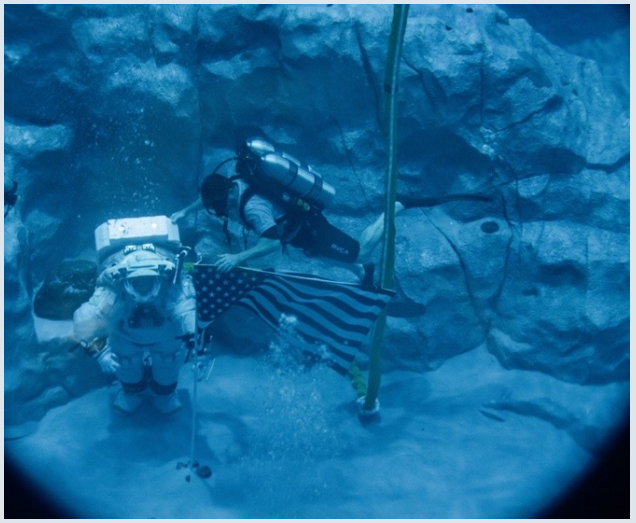
Artist's Illustration: Two suited crew members work on the lunar surface. One in the foreground lifts a rock to examine it while the other photographs the collection site in the background.
u003cstrongu003eCredits: NASAu003c/strongu003e

NASA has selected Axiom Space and Collins Aerospace to advance spacewalking capabilities in low-Earth orbit and at the Moon, by buying services that provide astronauts with next generation spacesuit and spacewalk systems to work outside the International Space Station, explore the lunar surface on Artemis missions, and prepare for human missions to Mars.

- Vendors for Exploration Extravehicular Activity Services (xEVAS) announced June 2022
- Vendors provide commercial EVA *services* for ISS and Artemis missions
- NASA provides Insight and Collaboration functions to help vendors succeed
- Two vendors: Collins Aerospace (ISS Demonstration) and Axiom Space (Artemis III)
- Additional cross-over task orders (July 2023)
- Vendors were provided all xEMU Government Reference Designs, data and analyses, which are being leveraged in the xEVAS vendor designs

AXIOM SPACE

NASA



Photos credit Axiom Space

Collins Aerospace
An RTX Business

NASA

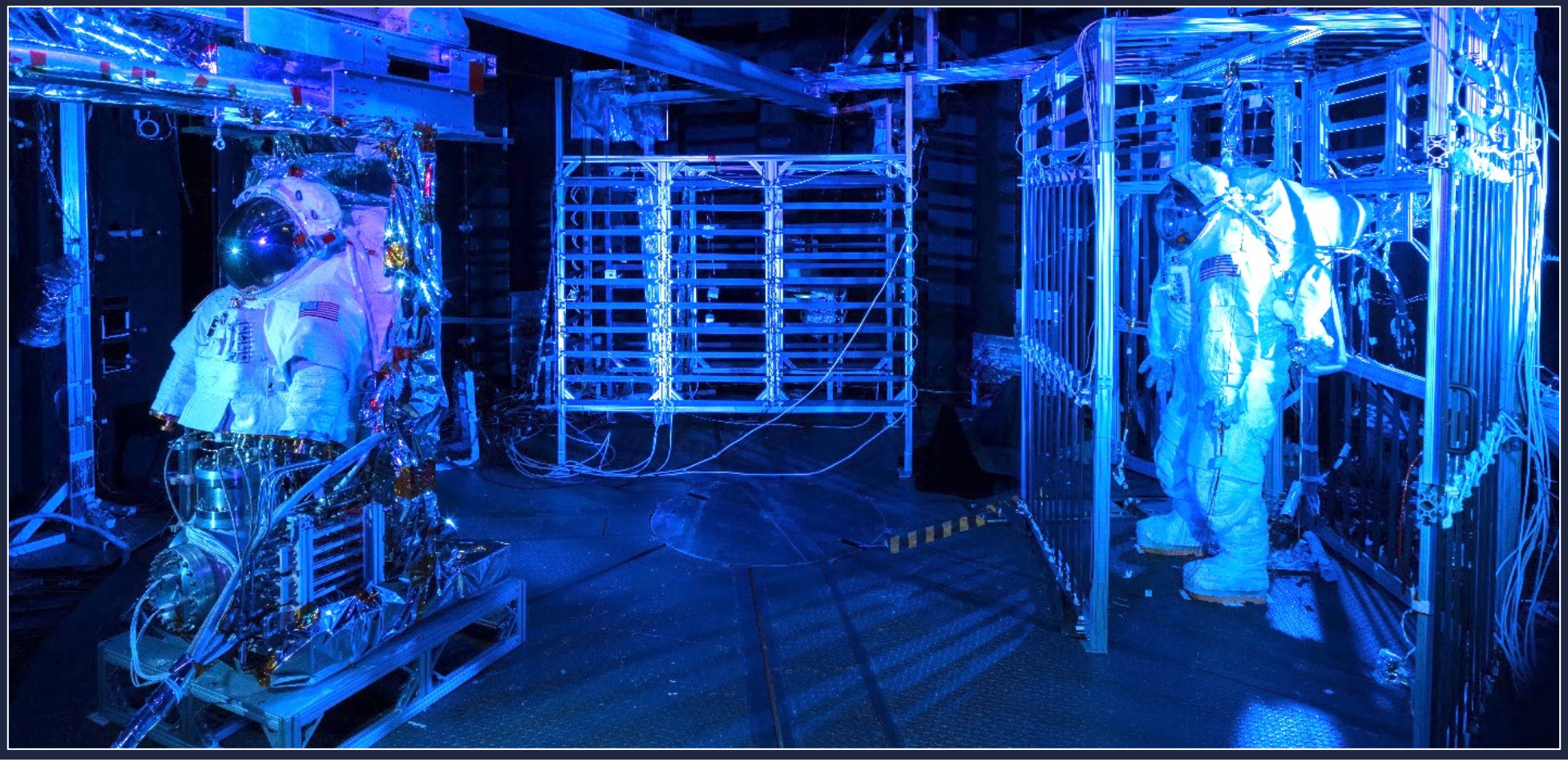
Photos credit Collins Aerospace

Testing & Integration

- xPGS test team became Integrated Test Team (ITT) on the Advanced Suit Team
- FY23 ITT Stats:
  - 128 suited human-in-the-loop tests
  - 53 unique test subjects
  - 10 different test facilities

xEMU TVAC

ICES-2024-75 (Overview) and 76, 81, 122, 130, 213, 215, 216, 217, 219



Elevated Suit Pressure Testing

Neutral Buoyancy Lab

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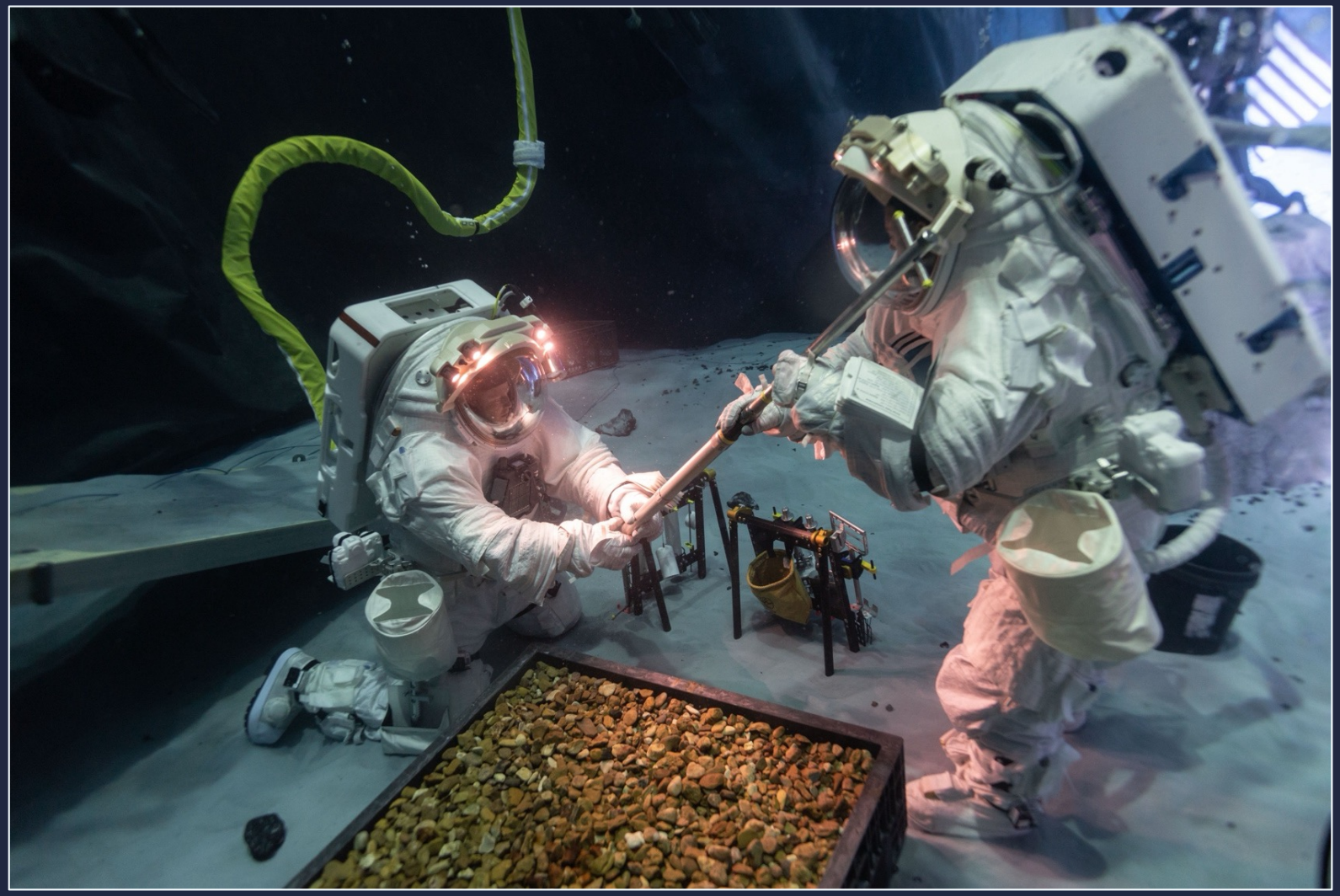

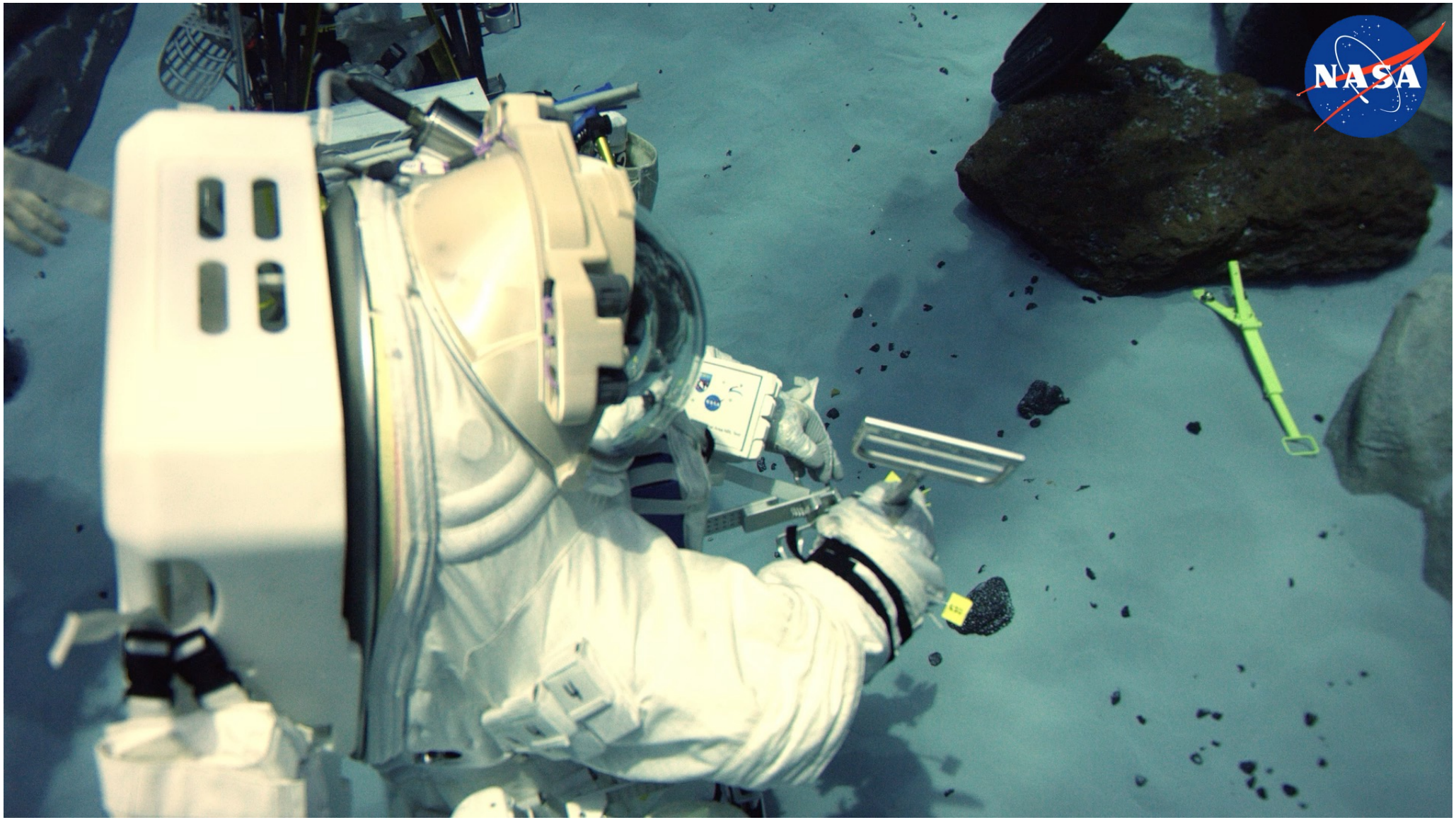
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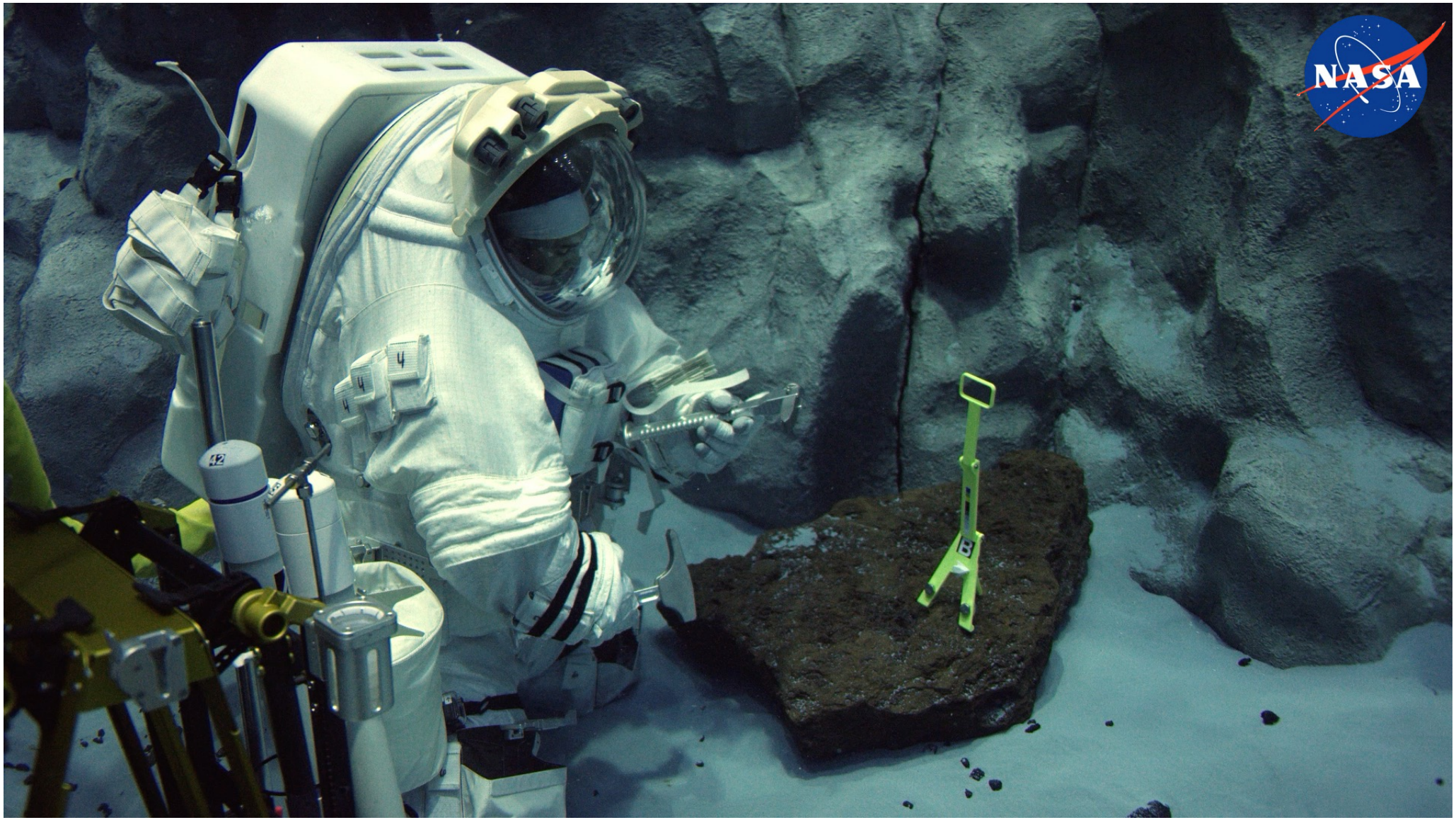
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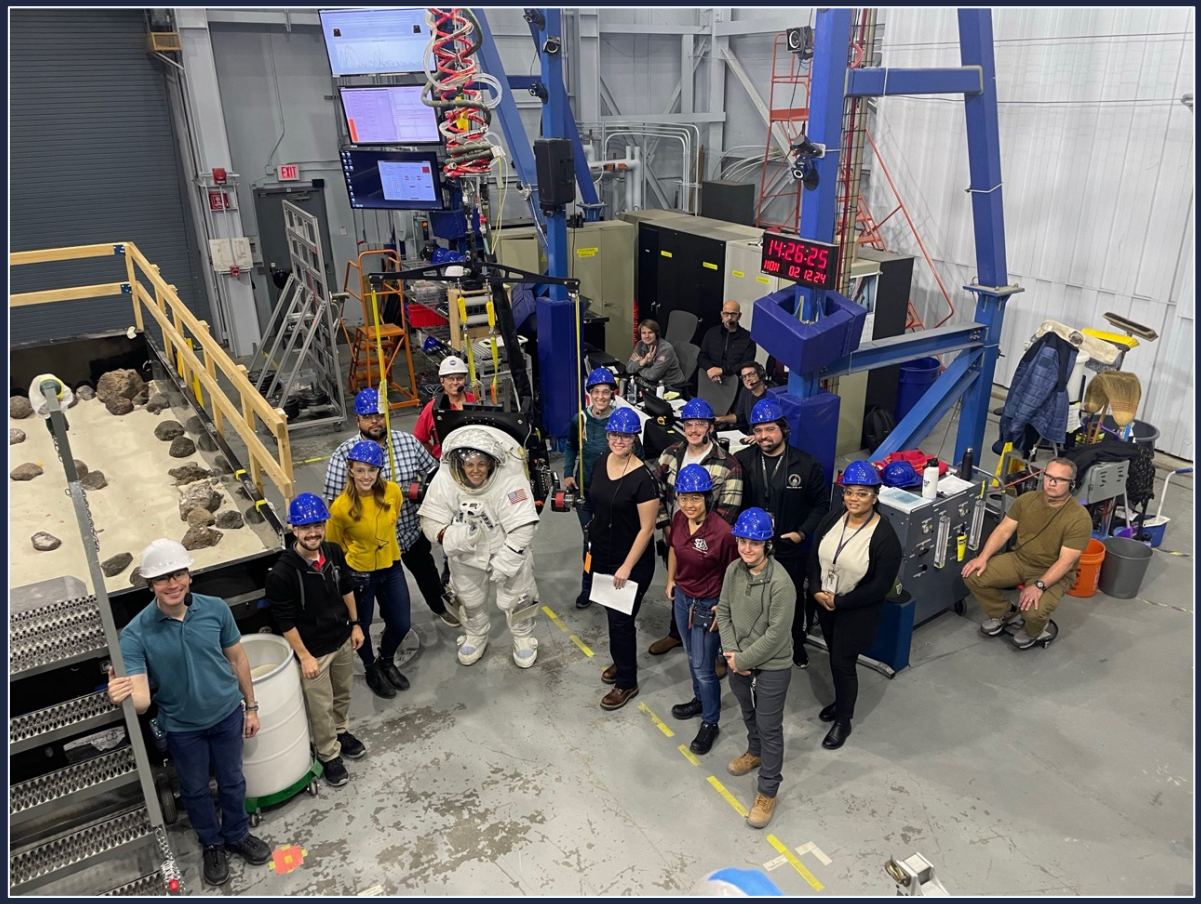
ARGOS



JETT5

And also…

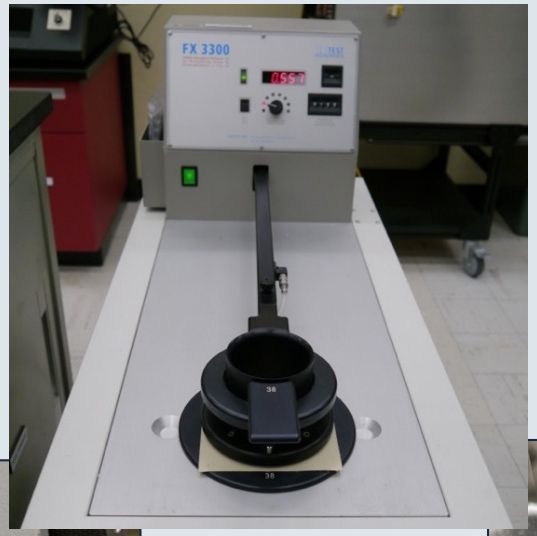
- Simulation quality assessments *(ICES-2024-110)*
- Shoulder strap offloading study *(ICES-2024-158)*
- Rockyard tool and operational concepts evaluations
- Planetary suit familiarization runs for crew
- Lunar Terrain Vehicle (LTV) interface tests
- Human Landing System (HLS) elevator tests
- Continued xPGS hardware lessons learned
  - Improvements
  - Cycle life
  - Sizing *(ICES-2024-485)*
- Got our own xEMU figurine
  - https://www.shopnasa.com/products/limited-edition-xemu-nasa-prototype-spacesuit

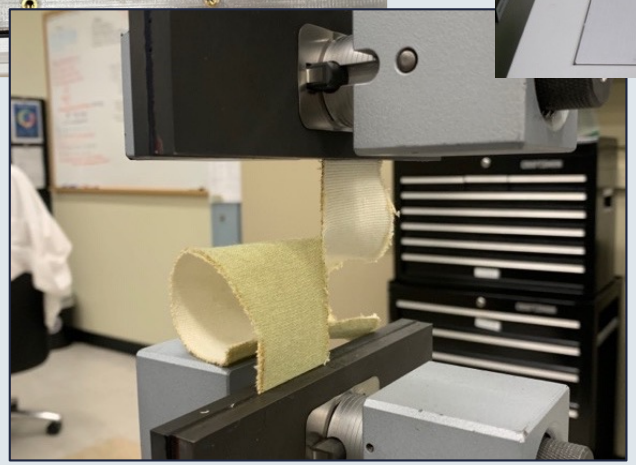
Technology Development

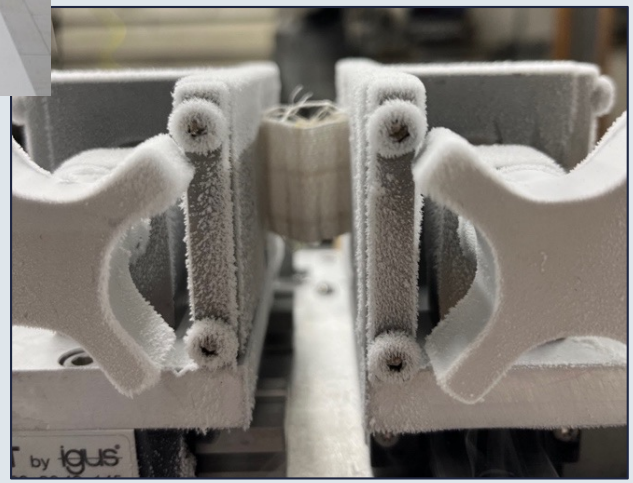
- Artemis Suit Materials
- NESC Glove Risk Mitigation
- xEMU Boot Thermal Vacuum Test
- Lunar Electrostatic Discharge (ESD) and Dust Mitigation Tool (LEDM) Vacuum Chamber Testing
- SBIR/STTR Portfolio
- Technology Development Roadmap

Artemis Suit Materials

Artemis Suit Materials







NESC Glove Risk Mitigation

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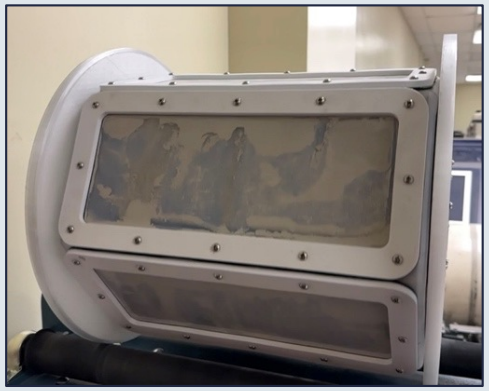

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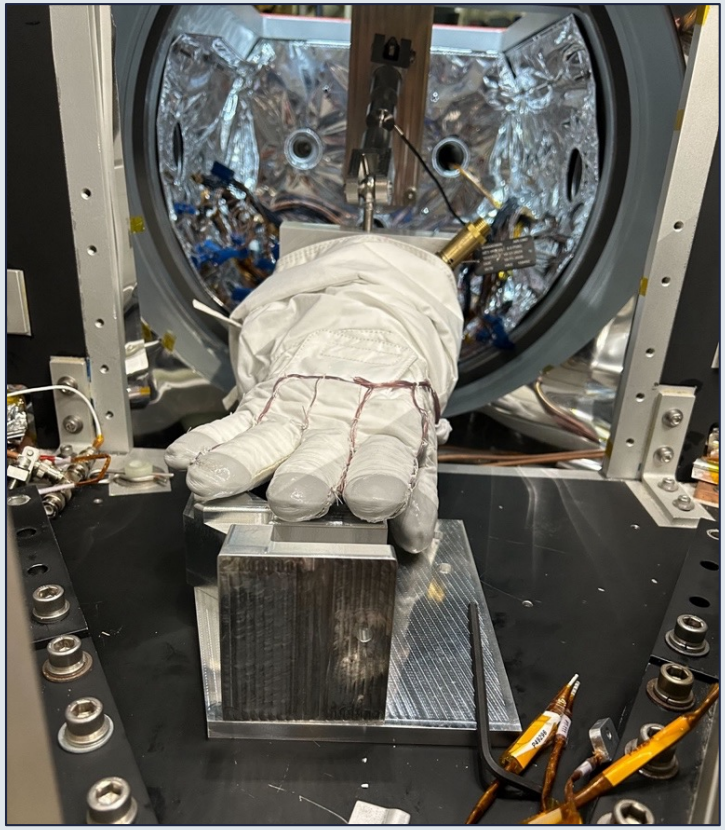
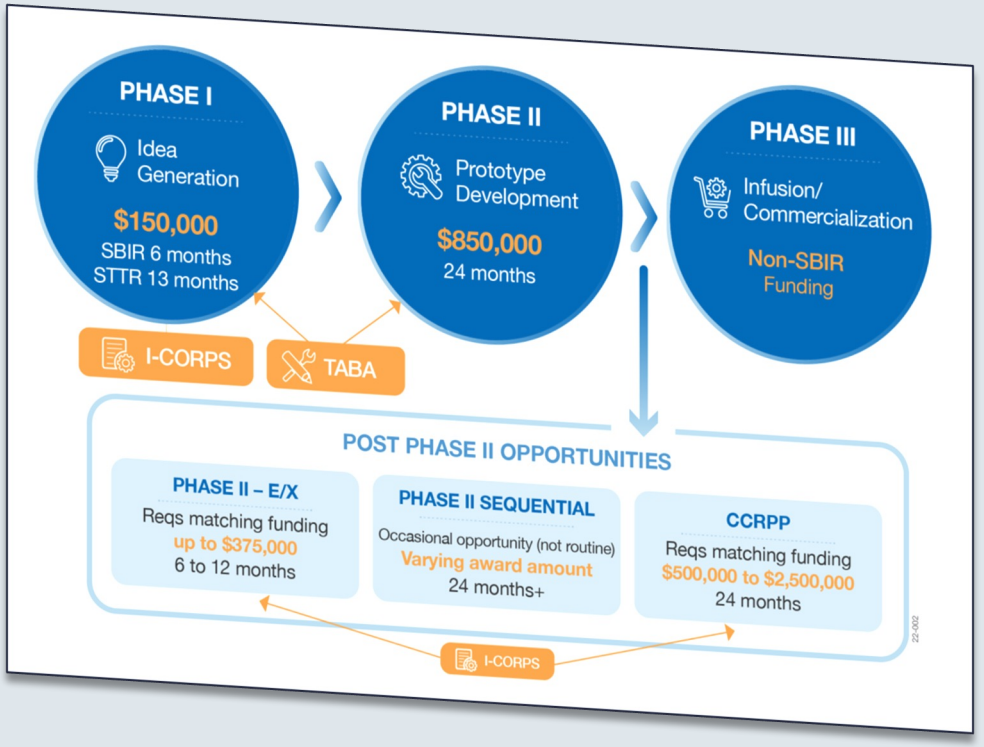
To be presented at ICES 2025

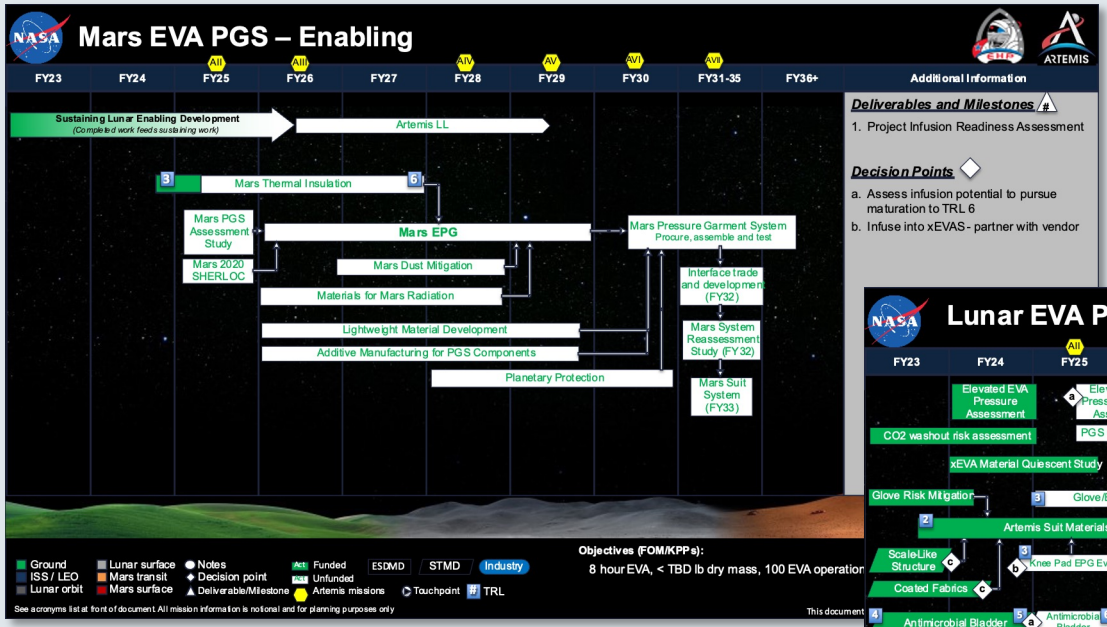


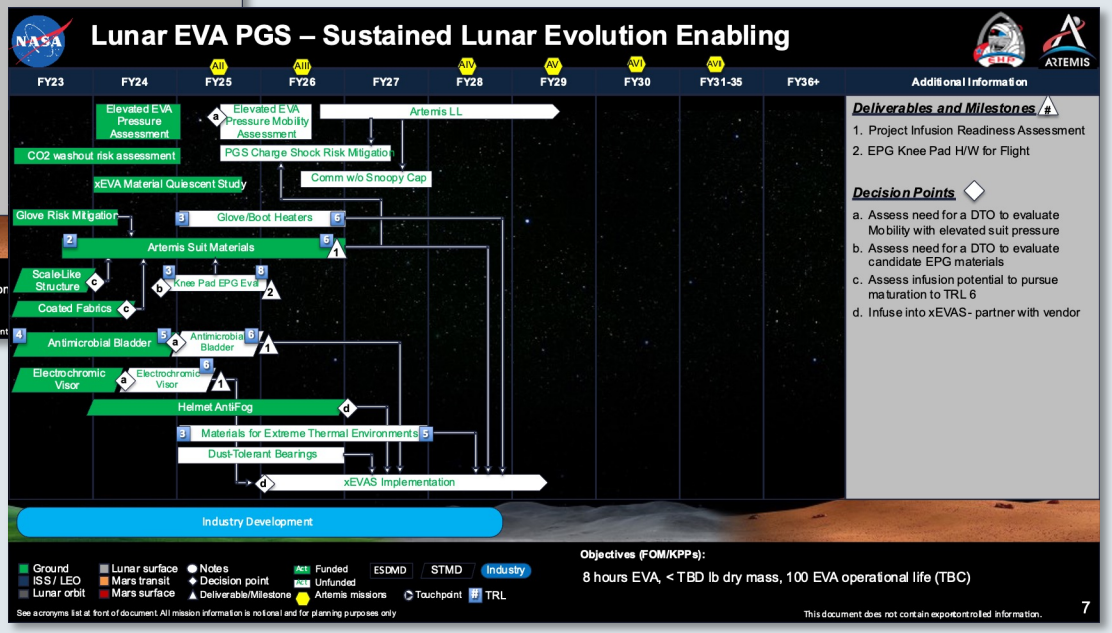
Small Business Portfolio

- Permanent Helmet Anti-Fog
  - Completed Phase I SBIR (5 vendors)
  - Starting Phase II (2 vendors)
- Outer EPG Material Development
  - Phase I SBIR
  - Phase II SBIR
  - Phase II STTR
- Improved LCVG Connectors
  - SBIR Phase II
- Persistently Anti-microbial Suit Bladders
  - SBIR Phase II
- Cryo and Mars Thermal Insulation Materials
  - Starting Phase I (3 vendors)



Technology Development Roadmap





ICES-2024-22

- The Advanced Suit Team at JSC is adapting to new exploration missions and commercial services, addressing EVA gaps and risks.
- We're advancing pressure garment hardware and technology for future Artemis and Mars missions.

Thank you for your attention!

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Advanced Suit Team – NASA JSC