INVESTIGATING SPACESUIT MOBILITY IN SPACEFLIGHT OPERATIONS USING MOTION CAPTURE TECHNOLOGY

THE MISSION

The Spacesuit Utilization of Innovative Technology Laboratory (S.U.I.T. Lab) research at Embry-Riddle Aeronautical University aims to investigate methods for recording, analyzing and optimizing motion capture data for spacesuit mobility.

Understanding how spacesuits restrict astronaut mobility allows the S.U.I.T. Lab to gain hands-on experimental learning and support industry with the standardization of procedures for spacesuit operations. Mobility analysis includes upper body movements such as flexion, extension, abduction, and adduction of the arms as well as intravehicular and extravehicular activities.

The lab makes use of a professional-grade motion capture system and the David Clark Company U2 Pressure Suit to collect preliminary motion data. Lessons learned will be applied to range of exploration activities including mobility for planetary exploration, emergency capsule egress, and the creation of virtual reality simulations. The lab research will provide future spacesuit manufacturers and spaceflight operators with a greater understanding of spacesuit mobility restrictions, and how to improve designs.

SUIT DESIGN AND ACTIVITIES

- As the current resurgence in the space industry moves towards human spaceflight again, many companies will look towards creating their own solutions for keeping pilots and passengers safe.
- Spacesuits are being designed for various applications and many suits specialize in different aspects of EVA and IVA operations. However, the S.U.I.T. Lab is working to create a standardized checklist for crews to outline during their activities inside or outside a vehicle. Results from motion capture analysis will determine which activities are most critical for suit testing.
- The checklist can be used before, during, and after any activity involving a spacesuit. It is intended to provide a crew with the ability to identify any problems or inconsistencies when operating with the suit. The checklist will be applicable to all pressurized suits and suits to work across all manufacturers of spacesuits.
- By standardizing checklists, new spacesuit designers such as Final Frontier Design can keep them in mind when creating their products. The use of motion capture before or during spacesuit manufacturing and testing will allow designers to confirm nominal suit performance that is in accordance with the tasks on standard checklist.

S.T. Lab for ERAU


Gemini 4 mission on June 3, 1965. (Image courtesy NASA)

Astronaut James B. Irwin, lunar module pilot, uses a scoop to make a trench in the lunar soil during Apollo 15 extravehicular activity (EVA). August 2, 1971. (Image courtesy NASA)