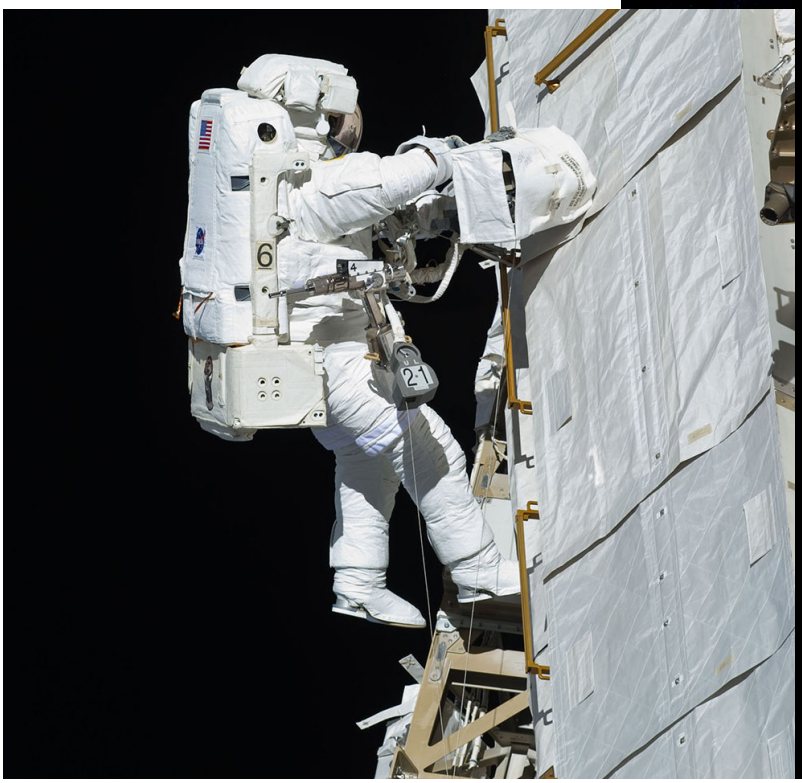
Johnson Space Center

Extravehicular Mobility Unit

The Extravehicular Mobility Unit (EMU) is comprised mainly of the spacesuit assembly and the Portable Life Support System, which provides breathable air for the astronaut and battery power for the suit's electrical functions. The EMU accommodates a variety of interchangeable systems that interconnect easily and securely in a single-handed operation for either normal or emergency use.

Services Provided

- System-level engineering insight into the hardware operational performance and detailed leadership into anomaly resolution.
- Real-time mission support for on-orbit activities.
- Ground training simulations for training and crew extraction from the Neutral Buoyancy Laboratory and vacuum chamber facilities.
- Engineering risk-based guidance for management and sustaining of the EMU hardware and forecast for long-term hardware life-cycle usage.
- Developmental proof of concept for changes and additions to the EMU hardware system.



Testing

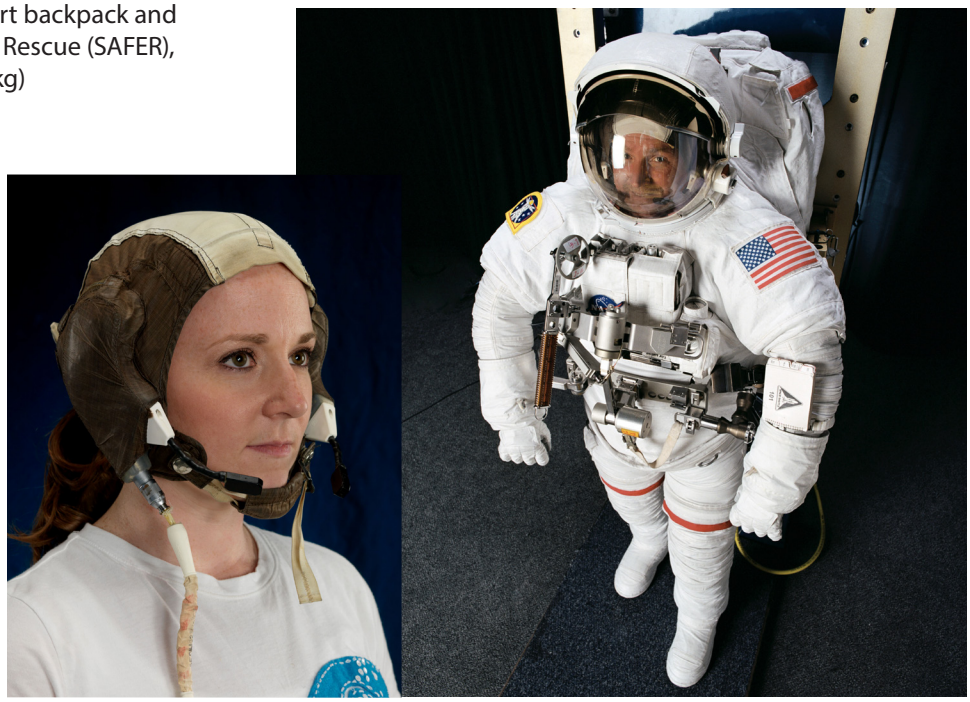
Spacesuits are unique in that they are anthropomorphic, customized spacecraft. They must provide environmental protection, mobility, and life support to the crewmember during spacewalks. The suit is modular in design, with many interchangeable parts. The upper torso, lower torso, arms, and gloves are manufactured in three different sizes for the major hard-good components (such as the hard upper torso) and can be assembled for each mission in combinations needed to fit male and female astronauts. This design is cost effective because the suits are reusable and not custom fitted as were Extravehicular Activity (EVA) spacesuits used in previous NASA manned space flight programs.

When preparing to work in space, the astronaut goes into the airlock of the International Space Station (ISS) and puts on the following parts of the EMU:

- A maximum absorbency garment, which is a modified incontinence diaper. (Urine collection devices are no longer used.)
- A liquid cooling and ventilation garment, a one-piece mesh suit made of spandex, zippered for front entry. The garment has water-cooling tubes running through it to keep the wearer comfortable during active work periods.
- An in-suit drink bag containing 21 ounces of potable water.
- The "Snoopy Cap," which is a communications carrier assembly with earphones and microphones for two-way communications and caution-and-warning tones.
- A biomedical instrumentation subsystem to provide flight doctors on the ground insights into a crewmember's health during EVAs.

Interesting Fact

- The original EMU was used from 1979 to 2002. The EMU design was upgraded in 2002 and has been in use since that time.
- The EMU design is modular, which means that it has separate pieces that can be put together to fit each astronaut. The current suit design is capable of fitting a 5th percentile female (5' tall, 110 lb) up to a 95th percentile male (6'2" tall, 223 lb).
- The shuttle EMU, with the life support backpack and the Simplified Aid for Extravehicular Rescue (SAFER), weighs approximately 275 lb (124.7 kg) on Earth and is pressurized to 4.3 psia (29.6 kPa).
- The ISS EMU, with the life support backpack and SAFER, weighs approximately 319 lb (145 kg) on Earth and is pressurized to 4.3 psia (29.6 kPa).



For the benefit of all

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