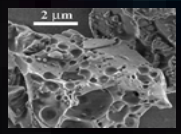
Human Research Program
Space Human Factors and Habitability Element

The three project areas of the Space Human Factors and Habitability Element work together to achieve a working and living environment that will keep crews healthy, safe, and productive throughout all missions – from Earth orbit to Mars expeditions.

Advanced Environmental Health (AEH) Project



The AEH Project develops and evaluates advanced habitability systems and establishes requirements and health standards for exploration missions. Tasks include the following:

- Collect and analyze terrestrial and on-orbit data to establish and update crew exposure standards for all chemicals, microbes and dust.
- Assess the acute and chronic toxicological risk of air or water contaminants in Lunar or Martian habitats.
- Monitor strategies and identify gaps for crew cabin environmental contamination monitoring and mitigation.
- Analyze lunar dust exposure routes such as those experienced during Apollo.
- Advise the Advanced Environmental Monitoring & Control (AEMC) project which develops technologies to sense environmental hazards for environmental control systems.

The AEMC Advisory role supports the creation of miniature environmental sensors for Constellation. Three AEMC products have been selected for on-orbit technology demonstration on ISS.

- Electronic Nose (ENose) provides first line of defense against hazardous substances in the air.
- Vehicle Cabin Air Monitor (VCAM) provides trace chemical detection.
- Colorimetric Solid Phase Extraction (C-SPE) provides water biocide monitoring.

The AEH project that likely has the greatest impact to Constellation is Lunar Dust Toxicology. A Lunar Airborne Dust Toxicology Advisory Group (LADTAG) composed of experts in toxicology and lunar geology is chartered to:

- Coordinate cellular response, pulmonary, dermatological and ocular toxicology.
- Perform lunar dust and simulant physiochemical characterization.
- Determine dust activation techniques to account for solar radiation and the presence of nanophase iron.
- Establish crew exposure limits and provide data to drive life support system dust control methods, personal protective equipment, flight rules, and monitoring to protect the crew from dust exposure.

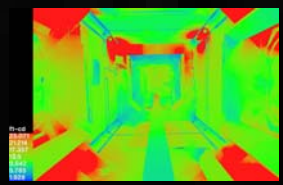
Advanced Food Technology (AFT) Project

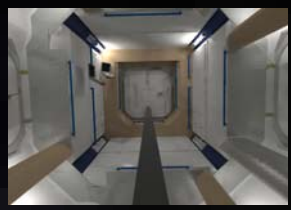
The ultimate goal of Advanced Food Technology (AFT) Project is to develop and deliver technologies for human centered spacecraft that will support crews on missions to the moon, Mars, and beyond.

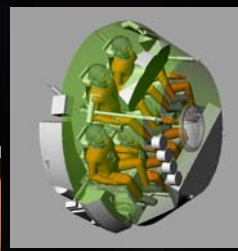
AFT is responsible for developing food systems for space vehicles and long duration missions that use a combination of extended shelf life stored foods and raw food products produced from higher plants or bulk raw commodities. AFT research addresses nutritional, psychological, safety, and acceptability requirements, while minimizing mass, volume, power, waste and trace gas emissions. In doing so, the AFT must address different mission scenarios that present challenges beyond conventional knowledge concerning food.

The goals of the AFT are to develop a stored food system that is nutritious, palatable and provides a sufficient variety of foods to support significant crew activities on a mission of at least 3 years duration. Foods should maintain safety, acceptability, and nutrition for the entire shelf life of 3 - 5 years. Shelf life extension may be attained through new food preservation methods and/or packaging.

Space Human Factors Engineering (SHFE) Project







The Space Human Factors Engineering (SHFE) Project's goal is to ensure a safe and productive environment for humans in space. With missions using new technologies at an ever-increasing rate, it is imperative that these advances enhance crew performance without increasing stress or risk.

The SHFE Element integrates knowledge about human capabilities and system engineering methodologies into space craft design and task design. The objective of the SHFE Element is to advance the state of the art and develop standards for such items as:

- human-machine interfaces
- habitation systems and interior layout
- information management

SHFE ground and flight research projects are developed from proposals submitted by NASA, and by academia, industry, and other government agencies. Research results can be found in the Life Sciences Living Task Book.

The SHFE also plans Educational and Outreach activities through workshops and conferences.