National Aeronautics and Space Administration

Johnson Space Center

HUMAN HEALTH AND PERFORMANCE

Exploring Space | Enhancing Life

Human Factors Engineering & Human Systems Integration

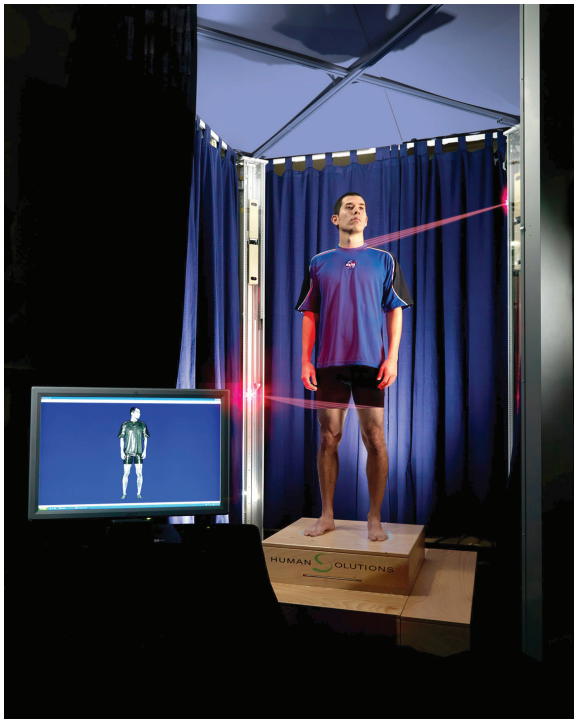
Understanding Interactions of Humans with Other Elements of a System

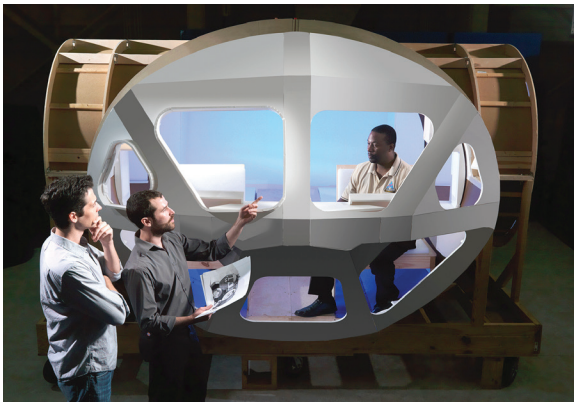
There is no such thing as an “unmanned” system. Designing equipment, interfaces, devices and integrating human users into a system from the concept to operations improves total system performance and reduces risk to the operators. Development of a system to accommodate the human body and its cognitive abilities and limitations is vital to optimizing for human health and performance and ensuring the system delivers its desired function.

World Renowned Skills and Unique Capabilities

The Johnson Space Center, a world leader in human spaceflight, possesses unique knowledge, skills, and capabilities that can be applied to solving human health and performance challenges here on earth—particularly those related to operating in extreme and harsh environments.

Our space human factors engineering expertise and capabilities have been shaped by over 50 years of spaceflight operations and research in the uniquely complex, challenging, and highly constrained spacecraft environment. This knowledge has been codified in human factors standards and best practices for design of architectural and engineering solutions and technologies, and has been applied to integrated testing of human-system interfaces, and objective evaluation of human performance in complex systems.





These Human Factors Engineering & Human Systems Integration skills and knowledge can be used to aid in the development of new systems and improvement on evaluation of existing systems including new spacecraft for commercial crew, commercial orbital facilities, and space tourism; automobiles and other transportation devices; human-machine interactions including displays and controls and wearable systems; terrestrial challenges including design for operations in extreme environments or remote environments such as ocean or arctic operations exploration and working in harsh environments to optimized human performance; and human-centered design and evaluation of lighting viewing, and display systems.

Human Integration Design Handbook and Human System Integration Processes

Encompass unique human-centered knowledge and products that include Space Human Factors Engineering (SHFE) requirements, rationales, supporting information, and processes to verify effective implementation of systems and operations that enable optimal human health and performance in extreme environments such as space. These complement the Agency Spaceflight Human Systems Standards and serve as a how–to guide of best practices.

Human-Centered Design (HCD

provides products such as design prototypes and evaluation-based human factors recommendations for operating in extreme/harsh environments. The Habitability Design Center (HDC) is a unique conceptual human-centered design studio leveraging expertise in industrial design, architecture, and systems engineering to solve the unique challenges of living and working in extreme environments, and specializes in concept design, rendering of design concepts, full scale and part scale mockups and models, and rapid delivery of functional prototypes.

International Space Station (ISS) Crew Comments Database

JSC maintains the Crew Comments Database, a fully searchable database capturing comments from every ISS crew mission debrief, and represents over 50 crew-years of crew experience on orbit. The database and captures unique knowledge about ISS systems, hardware, and living conditions of the crew as they live and work in space. This database could be useful for Commercial Crew and space tourism efforts, extreme environment operations such as oil & gas exploration, and ocean vessel and facilities operations.

Anthropometry and Biomechanics

The Anthropometry and Biomechanics Facility (ABF) unique expertise can aid in identifying potential ergonomic and occupational biomechanical problems and recommending solutions to improve passenger's safety, comfort, and injury protection. ABF has capability to perform high resolution laser scan measurements of humans and other complex or irregular objects, and performs multi-joint motion tracking of operators in complex environments such as cockpits. ABF also maintains the Anthropometry Database including measurements of both suited and unsuited crewmembers.

Usability Analysis and Testing

Provides analysis, evaluation, and usability testing of human interfaces for work areas and equipment, with specialty subjective measures Workload and Handling Qualities as well as instrumentation including eye-tracking, and portable computing.

Lighting Evaluations

Our unique lighting design and evaluation capabilities can be used to assess crews' direct and indirect viewing, including characterization of existing lighting systems and graphical, math model based prediction of lighting.

Graphics Research and Analysis

Performs computer-aided human factors analysis and simulation that address human engineering issues for human system designs and analyses such as lighting and viewing, habitable volume and ergonomics.

For the benefit of all

For more information:
NASA Human Health and Performance Center at
http://NHHPC.nasa.gov or go to:
http://www.nasa.gov/centers/johnson/slsd/

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