HFES Policy Statement:
Human Systems Integration (HSI)

The goal of Human Systems Integration (HSI) is "to optimize total system performance and total ownership costs, while ensuring that the system is designed, operated, and maintained to effectively provide the user with the ability to complete their mission"[1]. HSI is an "umbrella" discipline and management approach that orchestrates the efforts of selected people-related disciplines; seeks to optimize the integration of humans with complex systems; maximizes the performance of system-related humans during system operation, maintenance and support; and, minimizes customer life-cycle costs related to personnel (e.g., acquisition, healthcare, safety, education and training, berthing, compensation, moving, and personnel management). HSI reduces total system costs as well the potential for costly accidents [2, 7].

Human Systems Integration is currently practiced by US and international government agencies and contractors in the conception, design, development, production and sustainment of systems [3, 4]. HSI domains include: Human factors engineering (HFE), Manpower, Personnel, Training, Force Protection and Survivability, Safety and Occupational Health, and Habitability [1, 7]. Currently, an industry standard exists for marine systems [5] and for Department of Defense (DoD) systems (currently in draft form) [6].

HFES endorses the following policy positions:

1. The conception, design, development, test, operation, and sustainment of all complex systems used or maintained by people requires the application of Human Factors principles and design criteria, and the coordination of Human Factors activities with other systems engineering, design, management, and logistics disciplines, as described in HSI standards and guidelines.
2. The application of Human Factors research and design principles should support HSI in the following activity areas: planning, budgeting, scheduling, coordination, requirement management, analysis, tradeoffs, design, test and evaluation, technical procedure development, change and configuration management, system design and management review support, formal requirement verification, risk/issue/opportunity management, subcontracting, documentation, progress reporting and quality control.
3. The DoD and other Federal departments should require the application of HSI processes and standards in all system acquisition programs.
4. Each military service should have a documented policy describing how they implement DoD HSI requirements on their acquisition programs, and across the system life-cycle.
5. The DoD, each service branch, and other Federal agencies that acquire systems for human use should have a senior executive service official reporting to the senior acquisitions officer who oversees HSI requirements, activities, and personnel, and serves as an HSI advocate and point-of-contact within the organization.
6. Qualified Human Factors practitioners should be assigned responsibility for the conduct of the following HSI activities:
    a. Developing user-centered systems requirements, to include support of human perceptual, cognitive, and physical tasks and performance.
    b. Adapting and applying Human Factors design criteria to equipment and software with which humans interface, to ensure that system's users and maintainers will be satisfactorily accommodated;
    c. Conducting mission, function, task, cognitive and workload analyses, and applying results, to minimize the risk that human performance requirements will not be met under all expected conditions;

d. Conducting system test and evaluation activities associated with assessing the impact of the system design on human situation awareness, workload, task performance, error, and physical well being, and recommending design changes to minimize negative impacts and improve outcomes;

e. Verifying compliance with system specification requirements assigned to Human Factors;

f. Documenting Human Factors plans, activities and results; developing and submitting Human Factors deliverable data.

g. Coordination with other HSI domain practitioners, the HSI program manager, and systems engineering management and processes.

7. The DOD and other federal agencies should ensure that HSI activities are performed by qualified HSI professionals with bachelors or graduate level degrees in human factors engineering, psychology, human-systems integration, safety, physiology, or a related degree field. These experts should have degrees that include education in the physical, physiological, perceptual, cognitive, and/or organizational considerations that affect human systems performance, and the application of this knowledge to the design of technologies, organizations and systems [4,7]. The Human Factors and Ergonomics Society maintains a list of accredited degree programs that provide the required expertise to perform work in human factors engineering, force protection and survivability, habitability, and safety and occupational health, and which are recommended for the overall performance of HSI tasks. Professional certification in the United States is provided by the Board of Certification of Professional Ergonomics (BCPE). Because HSI is multi-disciplinary and involves work by professionals with many different degrees, it is recommended that BCPE certification be required for overseeing the performance of all HSI work.

References

1. Department of Defense Instruction 5000.02, "Operation of the Defense Acquisition System," August 10, 2017.

2. Endsley, M. R. (2016). Building resilient systems: Incorporating strong human-systems integration. Defense AT&L Magazine, XLV(1), 6-12.

3. Handbook of Human Systems Integration, Harold R. Booher Editor, John Wiley and Sons, 2003.

4. Human Systems Integration in the System Development Process – A new Look, National Research Council, Richard W. Pew and Anne S. Mavor, Editors, 2007.

5. ASTM Standard F1166 - 07(2013), Standard Practice for Human Engineering Design for Marine Systems, Equipment, and Facilities, AASTM Subcommittee F25-07, 2013.

6. SAE International Best Practice Standard SAE6906, "Human Systems Integration," (Draft), 2018.

7. APA Handbook of Human Systems Integration, Deborah A. Boehm-Davis, Francis T. Durso, and John Lee.Editors, APA, 2015.