



## DoD INSTRUCTION 5000.95

### HUMAN SYSTEMS INTEGRATION IN DEFENSE ACQUISITION

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**Originating Component:** Office of the Under Secretary of Defense for Research and Engineering

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**Approved by:** Heidi Shyu, Under Secretary of Defense for Research and Engineering

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**Purpose:** In accordance with the authority in DoD Directive (DoDD) 5137.02, the policy in DoDD 5000.01, and the transition plan in DoD Instruction (DoDI) 5000.02, this issuance establishes policy, assigns responsibilities, and prescribes procedures for:

- Human systems integration (HSI) in the Defense Acquisition System.
- HSI domains, integration, implementation, and reporting across the DoD acquisition enterprise for personnel responsible for the development, testing, production, training, operations, and sustainment of defense acquisition programs.

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## **SECTION 1: GENERAL ISSUANCE INFORMATION**

### **1.1. APPLICABILITY.**

a. This issuance applies to OSD, the Military Departments, the Office of the Chairman of the Joint Chiefs of Staff and the Joint Staff, the Combatant Commands, the Office of Inspector General of the Department of Defense, the Defense Agencies, the DoD Field Activities, and all other organizational entities within the DoD (referred to collectively in this issuance as the “DoD Components”).

b. The policies in this instruction are applicable to all systems and services acquired via the Defense Acquisition System.

### **1.2. POLICY.**

The DoD will utilize HSI in defense acquisition to provide a disciplined, unified, and interactive approach to integrate human considerations across system design to optimize total system performance and minimize life-cycle costs.

## SECTION 2: RESPONSIBILITIES

### 2.1. UNDER SECRETARY OF DEFENSE FOR RESEARCH AND ENGINEERING (USD(R&E)).

In addition to the responsibilities in Paragraph 2.6., the USD(R&E):

a. In their capacity as Principal Staff Assistant as described in DoDD 5137.02:

(1) Provides strategic guidance and oversight of science and technology, develops governing policies, and advances practices and workforce competencies for HSI and systems engineering (SE) to improve human performance.

(2) Advises for all matters regarding developmental prototyping and experimentation, developmental testing activities and programs.

(3) Establishes policies for developmental test and evaluation.

(4) Ensures appropriate test facilities, test ranges, tools, and related modeling and simulation capabilities are maintained within the DoD.

(5) Approves the developmental test and evaluation plans within Test and Evaluation Master Plans for those programs identified for direct oversight, in accordance with DoDI 5000.89.

b. Coordinates with the Under Secretary of Defense for Personnel and Readiness (USD(P&R)) and the Under Secretary of Defense for Acquisition and Sustainment (USD(A&S)) to develop HSI policy.

### 2.2. USD(P&R).

In addition to the responsibilities in Paragraph 2.6., the USD(P&R):

a. In their capacity as Principal Staff Assistant as described in DoDD 5124.02, is responsible for the monitoring of the operations tempo and personnel tempo of the Military Services.

b. Coordinates with the USD(R&E) and USD(A&S) to develop HSI policy and guidance related to personnel and readiness.

### 2.3. USD(A&S).

In addition to the responsibilities in Paragraph 2.6., the USD(A&S) coordinates with the USD(R&E) and USD(P&R) to develop HSI policy and guidance related to acquisition in accordance with the responsibilities and functions, relationships, and authority as described in DoDD 5135.02.

#### **2.4. DIRECTOR OF OPERATIONAL TEST AND EVALUATION (DOT&E).**

In addition to the responsibilities in Paragraph 2.6., the DOT&E:

a. Incorporates the adequate evaluation of HSI in an operational environment in DOT&E policy and procedures in accordance with DoDD 5141.02 and this issuance.

b. For programs designated with DOT&E oversight, approves HSI plans for usability and user testing for human to machine interface analysis under operational conditions.

#### **2.5. DOD CHIEF INFORMATION OFFICER.**

In addition to the responsibilities in Paragraph 2.6., the DoD Chief Information Officer coordinates with the USD(R&E) and USD(A&S) to ensure that DoD cybersecurity policy, standards, and guidance is reflected in HSI throughout the acquisition life cycle, in accordance with Section 3 of this issuance.

#### **2.6. OSD AND DOD COMPONENT HEADS.**

The OSD and DoD Component heads ensure that acquisition programs implement an HSI program early in the acquisition process that continues throughout the program life cycle (e.g., from the development of requirements to design and production and through the sustainment and retirement phases of all acquisition programs), in accordance with Section 3. HSI-related and human performance requirements will include feasible metrics that meet user needs and minimize life-cycle costs.

## SECTION 3: HSI PROCEDURES

### 3.1. GENERAL.

Component capability developer or program manager will:

a. Plan for and implement an HSI program from initial user requirements through the program life cycle to system disposal, appropriate to the system's acquisition pathway. The goal is to:

(1) Optimize total system performance.

(2) Reduce total ownership costs.

(3) Ensure that the system is designed to be operated, maintained, and supported while providing users with the ability to effectively complete their mission(s).

b. Perform, document, and manage program and systems human-centered design considerations and readiness risks through trade-off analyses among the HSI domains. The trade-off analyses will ensure human performance data systematically informs and facilitates total system performance in both materiel and non-materiel solutions during SE activities.

c. Ensure that DoD Component HSI subject matter experts (SMEs) and HSI practitioners are engaged with working groups tasked with the development and review of program documents that:

(1) Manage HSI planning.

(2) Report on HSI program and HSI domain level execution to the OSD and DoD Component heads assigned responsibilities in Section 2 throughout the course of the program.

(3) Inform program managers on acquisition program decisions.

### 3.2. HSI PLANNING.

a. The DoD Component capability developer or program manager will formulate a comprehensive HSI program using an appropriate strategy to ensure HSI-related and human performance requirements are achieved. The program will consist of risk management, engineering, analysis, and human-centered design activities, in accordance with DoDI 5000.02 and including, but not limited to:

(1) An HSI management plan, as outlined in Service component HSI-plan guidance.

(2) The human engineering design approach for the operator and maintainer, which may include a human viewpoint architecture description.

- (3) Task analyses.
- (4) Analysis of human error.
- (5) Use of human modelling and simulation.
- (6) Usability and other user testing to support and inform human and machine interface analysis under operational conditions.
- (7) HSI risk management maintained through:
  - (a) Design.
  - (b) Development.
  - (c) Testing.
  - (d) Production.
  - (e) Fielding.
  - (f) Sustainment.
- (8) A training strategy for leaders, operators, maintainers, and support personnel, as well as developing options to deliver training capabilities for individual and collective conditions.
  - b. Oversight and approval of HSI management plans, programs, and activities will be provided by the appropriate OSD and DoD Component heads in accordance with Section 2 of this issuance.
  - c. HSI planning and program implementation will focus on the management, coordination, collaboration, integration, and trade-space analysis among the seven HSI domains recognized by the DoD and specified in Paragraphs 3.3. through 3.9.

### **3.3. HUMAN FACTORS ENGINEERING (HFE) DOMAIN.**

- a. The DoD Component capability developer or program manager will, in conjunction with DoD Component HSI SMEs and HSI practitioners, implement HFE principles to ensure that system design considerations are compatible with the users' capabilities and limitations. System design considerations include, but are not limited to:
  - (1) Design and layout of work environment(s).
  - (2) User and human-machine interfaces (hardware and software).
  - (3) Design for the maintainer and operator.
  - (4) Automation.

- (5) Maintainability and accessibility.
- b. System designs will minimize or eliminate system characteristics that require:
  - (1) Excessive cognitive, physical, and sensory skills.
  - (2) Workload-intensive tasks that may result in:
    - (a) Extensive training.
    - (b) Mission-critical errors.
    - (c) Reliability failures.
    - (d) Excessive or avoidable maintenance impacts on readiness.
    - (e) Safety or health hazards.

### **3.4. PERSONNEL DOMAIN.**

- a. The DoD Component capability developer or program manager will:
  - (1) In conjunction with DoD Component HSI SMEs and HSI practitioners:
    - (a) Identify the knowledge, skills, abilities, and other characteristics to determine the personnel population of the system.
    - (b) Define characteristics of target military occupational specialties (MOSs).
    - (c) Define the human performance characteristics of the user population based on the system description.
  - (2) Consider personnel availability (e.g., recruiting, retention, promotion, and assignment to tasks) and cognitive and physical characteristics and capabilities of intended users during system design to ensure that the target user population is best prepared to operate, maintain, and sustain materiel and systems.
  - (3) Consult with appropriate personnel to mitigate readiness, personnel tempo, and funding risks and issues for those programs that:
    - (a) Have skill requirements that exceed the knowledge, skills, abilities, and other characteristics of current MOSs and civilian career fields; or
    - (b) Require additional skill indicators or hard-to-fill MOSs or civilian career occupations.
- b. To the extent possible, systems will not require special cognitive, physical, or sensory skills beyond those found in the specified user populations.



### 3.5. HABITABILITY DOMAIN.

The DoD Component capability developer or program manager will, in conjunction with DoD Component HSI SMEs and HSI practitioners:

a. Establish:

(1) Requirements for the physical environment (e.g., adequate space and temperature control).

(2) As appropriate, requirements for personnel services (e.g., medical and mess) and living conditions (e.g., berthing and personal hygiene) that have:

(a) A direct impact on meeting or sustaining human performance; or

(b) An adverse impact on quality of life and morale such that the warfighter capability, recruitment, or retention is degraded.

b. Consider the cybersecurity requirements for systems supporting living and working environments or conditions that have a direct impact on operational performance, in accordance with DoDI 8500.01.

### 3.6. MANPOWER DOMAIN.

a. The DoD Component capability developer or program manager will, as a part of HSI, in conjunction with DoD Component HSI SMEs and HSI practitioners, contribute to efforts to minimize program support costs by addressing manpower affordability early in the acquisition process. Additionally, the military and civilian manpower resources will be programmed in accordance with validated manpower requirements. Civilians will be managed solely on the basis of workload and fiscal year funding, in accordance with:

(1) Section 129a of Title 10, United States Code.

(2) DoDD 1100.4.

b. In advance of contracting for operational support services, the acquisition program manager will, in conjunction with the designated DoD Component manpower authority, determine the most efficient and cost-effective manpower mix of military, civilian, or contract personnel.

c. The mix of military, DoD civilian, and contract support necessary to operate, maintain, train, and support the system based on manpower mix criteria in accordance with DoDI 1100.22.

d. Manpower mix data will be:

(1) Reported to manpower and cost analysts.

(2) Factored into the preparation of independent cost estimates and DoD Component cost estimates via the Cost Analysis Requirements Description (CARD).

e. The cost of trained manpower to operate, maintain, and sustain acquisition programs will be reported to the Cost Assessment and Program Evaluation and the Office of the USD(P&R), via the CARD or CARD-like document, in accordance with DoDI 5000.73. Manpower data from the CARD will be submitted directly to the Office of the USD(P&R) Total Force Manpower Directorate. Guidance on the CARD is available from the Office of the Director of Cost Assessment and Program Evaluation.

f. In accordance with DoDI 7041.04, economic analyses used to support workforce mix decisions will account for fully-loaded costs (i.e., all variable and fixed costs, compensation and non-compensation costs, current and deferred benefits, and cash and in-kind benefits) approved by the DoD Component manpower authority.

### **3.7. TRAINING DOMAIN.**

a. In conjunction with DoD Component HSI SMEs and HSI practitioners, the Component capability developer or program manager will:

(1) Develop options for individual, collective, and joint training for operators, maintenance, and support personnel.

(2) Where appropriate, base training decisions on training effectiveness evaluations, which can be integrated with other test(s) and evaluation(s).

(3) Execute training system plans that consider the use of new learning techniques, simulation technology, embedded training, distributed learning, and instrumentation systems to provide the best training content delivery mechanism based on point-of-need and audience requirement.

b. When and where cost-effective and practical, use simulation-supported embedded training. The training systems will fully support and mirror the interoperability of the operational system, in accordance with DoDD 1322.18.

c. Consider training in analysis of alternatives study when developing criteria for the study.

d. Training capabilities and requirements supporting major acquisition programs will be prioritized and fielded on par and concurrently with operational requirements, ensuring that the training community utilizes the most current simulated capability.

e. Systems operating in a joint environment will field training capabilities that replicate the joint environment. Training capability networked with other program training capability will be developed at an interoperability level necessary to support completion of joint tasks.

f. The major tasks identified in the job task analysis, training device document coordinating paper, and training plans will support a comprehensive analysis with special emphasis on options that:

- (1) Enhance user capabilities.
- (2) Maintain skill proficiencies.
- (3) Reduce individual and collective training costs.

### **3.8. SAFETY AND OCCUPATIONAL HEALTH (SOH) DOMAIN.**

a. The DoD Component capability developer or program manager, in conjunction with DoD Component HSI SMEs and HSI practitioners, will ensure that appropriate human SOH requirements are integrated across disciplines and into SE.

b. The SOH domain SMEs will collaborate with the system safety SMEs to recommend system design characteristics and provide for operations, maintenance, and support procedures that can:

- (1) Minimize the risks of:
  - (a) Death.
  - (b) Acute or chronic illness, disability, or injury, including traumatic brain injury to users.
  - (c) Damage or loss of equipment or property.
- (2) In conjunction with the other domain leads, enhance human job performance and productivity of the personnel who operate, maintain, or support the system in the intended operational environment(s).

### **3.9. FORCE PROTECTION AND SURVIVABILITY (FP&S) DOMAIN.**

a. The DoD Component capability developer or program manager will, in conjunction with DoD Component HSI SMEs and HSI practitioners:

- (1) Design systems, equipment, and facilities to mitigate or reduce the effects of threats that impact a user's ability to complete the mission by:
  - (a) Minimizing human impairment from direct threat events or accidents (e.g., toxic releases, ballistic threats, electro-magnetic pulse) and deliberate or accidental cyber events (e.g., denial of service, natural or man-made disruptions in network infrastructure and services during mission execution).

(b) Avoiding or withstanding man-made harmful or hostile environments (e.g., chemical, biological, and nuclear threats).

(2) Evaluate and reduce susceptibility and probability of personnel being attacked by mitigating fratricide and detectability through system and facility design.

b. Design consideration will:

(1) Include primary and secondary effects from these events.

(2) Consider any special equipment necessary for:

(a) Personnel survivability.

(b) Emergency egress.

## GLOSSARY

### G.1. ACRONYMS.

ACRONYM	MEANING
CARD	Cost Analysis Requirements Description
DoDD	DoD directive
DoDI	DoD instruction
DOT&E	Director of Operational Test and Evaluation
FP&S	force protection and survivability
HFE	human factors engineering
HSI	human systems integration
MOS	military occupational specialty
SE	systems engineering
SME	subject matter expert
SOH	safety and occupational health
USD(A&S)	Under Secretary of Defense for Acquisition and Sustainment
USD(P&R)	Under Secretary of Defense for Personnel and Readiness
USD(R&E)	Under Secretary of Defense for Research and Engineering

### G.2. DEFINITIONS.

These terms and their definitions are for the purpose of this issuance.

TERM	DEFINITION
<b>analysis of alternatives</b>	Assessment of the potential materiel solutions including performance, operational effectiveness and suitability, and estimated costs of alternative systems to meet a capability need.
<b>FP&amp;S domain</b>	The characteristics of a system that can: <ul style="list-style-type: none"> <li>Reduce fratricide, detectability, and probability of being attacked.</li> <li>Minimize system damage and soldier injury.</li> </ul>
<b>fratricide</b>	The accidental, unintentional killing of ones' own forces in war.

<b>TERM</b>	<b>DEFINITION</b>
<b>Habitability domain</b>	The consideration of the characteristics of systems focused on satisfying personnel needs that are dependent upon physical environment, such as berthing and hygiene.
<b>HFE domain</b>	The application of knowledge about human capabilities and limitations to system or equipment design and development to achieve efficient, effective, and safe system performance at minimum cost and manpower, skill, and training demands.
<b>HSI</b>	The SE process and program management effort that provides integrated and comprehensive analysis, design, and assessment of requirements, concepts, and resources for HFE, manpower, personnel, training, SOH, FP&S, and habitability.
<b>Manpower domain</b>	Total number of personnel or positions required to perform specific tasks. Indexed by requirements including jobs lists, slots, or billets characterized by descriptions of the people required to fill them and the number of people required to operate, maintain, train, and support a system.
<b>Personnel domain</b>	The human aptitudes (i.e., cognitive, physical, and sensory capabilities); knowledge, skills, abilities; and experience levels needed to properly perform job tasks and required to train, operate, maintain, and sustain materiel and information systems.
<b>SOH domain</b>	The characteristics of system design that can:  Minimize the risk of acute or chronic illness, disability, injury or death to the operator or maintainers.  Enhance the job human performance and productivity of personnel who operate, maintain, or support the system in the intended operational environment.
<b>total system performance</b>	The end state functionality achieved by a system when including the human with hardware and software components under its intended operational condition(s) to achieve required operational, effectiveness, and suitability, survivability, safety, and affordability.
<b>Training domain</b>	The policy, processes and techniques, training aids, devices, simulators and simulations, planning, and provisioning for the training, to include equipment used to train personnel to operate, maintain, and support a system.

<b>TERM</b>	<b>DEFINITION</b>
<b>user</b>	Humans who will operate, maintain, train, and support the equipment, system, or facility. Includes “End user” as defined in DoDI 5000.87.

## REFERENCES

- DoD Directive 1100.4, “Guidance for Manpower Management,” February 12, 2005
- DoD Directive 1322.18, “Military Training,” October 3, 2019
- DoD Directive 5000.01, “The Defense Acquisition System,” September 9, 2020
- DoD Directive 5124.02, “Under Secretary of Defense for Personnel and Readiness (USD(P&R)),” June 23, 2008
- DoD Directive 5135.02, “Under Secretary for Acquisition and Sustainment (USD(A&S)),” July 15, 2020
- DoD Directive 5137.02, “Under Secretary of Defense for Research and Engineering (USD(R&E)),” July 15, 2020
- DoD Directive 5141.02, “Director of Operational Test and Evaluation (DOT&E),” February 2, 2009
- DoD Instruction 1100.22, “Policy and Procedures for Determining Workforce Mix,” April 12, 2010, as amended
- DoD Instruction 5000.02, “Operation of the Adaptive Acquisition Framework,” January 23, 2020
- DoD Instruction 5000.73, “Cost Analysis Guidance and Procedures”, March 13, 2020
- DoD Instruction 5000.87, “Operation of the Software Acquisition Pathway,” October 2, 2020
- DoD Instruction 5000.89, “Test and Evaluation,” November 19, 2020
- DoD Instruction 7041.04, “Estimating and Comparing the Full Costs of Civilian and Active Duty Military Manpower and Contract Support,” July 3, 2013, as amended
- DoD Instruction 8500.01, “Cybersecurity,” March 14, 2014, as amended
- United States Code, Title 10, Section 129a