

SAE INTERNATIONAL G-45 HSI COMMITTEE PROCESS STANDARDS AT HSI AND DOMAIN LEVELS

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Bottom Line Up Front (BLUF)

- SAE International is a leader in the development of international standards.
- The SAE G-45 Human Systems Integration committee serves under the SAE Systems Management Council (SMC) and has:
 - Developed Best Practice Process Standards pertaining to HSI and the HSI Domains.
 - Supported the DoD in developing and revising HSI standards.
- This presentation describes the HSI process standards in the G-45 portfolio, the history and rationale for their development, their uses and applications, and how they fit into the structure of HSI and related standards as well as future efforts.

SAE International Overview

- The Society of Automotive Engineers (SAE) International is among the leaders of standards development as applied to all types of vehicles (ground, air, submarine) and beyond.
- “SAE International is a global association of more than 128,000 engineers and related technical experts in the aerospace, automotive and commercial-vehicle industries.
- Our core competencies are life-long learning and voluntary consensus standards development.”
(<https://www.sae.org/about>; accessed 14 December 2023)

G-45 HSI Committee Overview

- The SAE International G-45 HSI Committee was originally established in 1976, as a part of the Electronics Industry Association (EIA). Back then, it was known as the “Human Factors Committee” (updated to “HSI” in 2008).
- In concert with systems engineering, the HSI Committee focuses on processes, tools, requirements, and guidelines to ensure satisfactory human-system integration.

G-45 HSI Committee Overview

- Committee scope includes the HSI Domains:
 - Human Factors Engineering (HFE);
 - Manpower, Personnel, and Training (MPT);
 - Safety and Occupational Health (SOH);
 - Force Protection and Survivability (FP&S); and
 - Habitability
- Primary focus areas are defining, assessing/optimizing human-system interfaces; maximizing human and human-system performance; and minimizing personnel-driven customer ownership costs.

HSI and HSI Domain Standards Background

- In 1991, the DoD published DODI 5000.02, Defense Acquisition Management Policies and Procedures.
 - The 1991 Instruction mandated consideration of Human Factors and System Safety/Health Hazards, as well as selected aspects of Survivability, Training, Manpower, and Personnel.
- In 2003, DODI 5000.02 was updated, and Enclosure (7) fully addressed all seven Domains of Human Systems Integration.
 - The updated instruction provided guidance to procuring agencies on how to implement HSI on acquisition programs.
- In 2005, Steve Merriman (representing DOD HFE TAG/G-45 Committee) and Dr. Robert Foster (OSD Director) discussed HSI requirements for industry and decided to act upon it

HSI and HSI Domain Standards Background

- In June 2006, Steve Merriman met with Tri-Service HSI and Domain specialists in Orlando, FL to discuss how best to proceed with developing HSI requirements for industry.
 - Development of a MIL-STD for HSI was initiated but seemed an overly daunting task at the time.
- Later in 2006, the G-45 committee initiated a project to develop requirements for an HSI Program Plan.
 - Data Item Description (DID) for an HSI Program Plan (DI-HFAC-81743) was completed and approved by the DoD for use in 2007.
- In 2008, the G-45 committee initiated a project to develop a DID for an HSI Report to provide HSI status for major milestone reviews (e.g., Milestone C).
 - A DID for an HSI Report (DI-HFAC-81833) was approved in 2011.

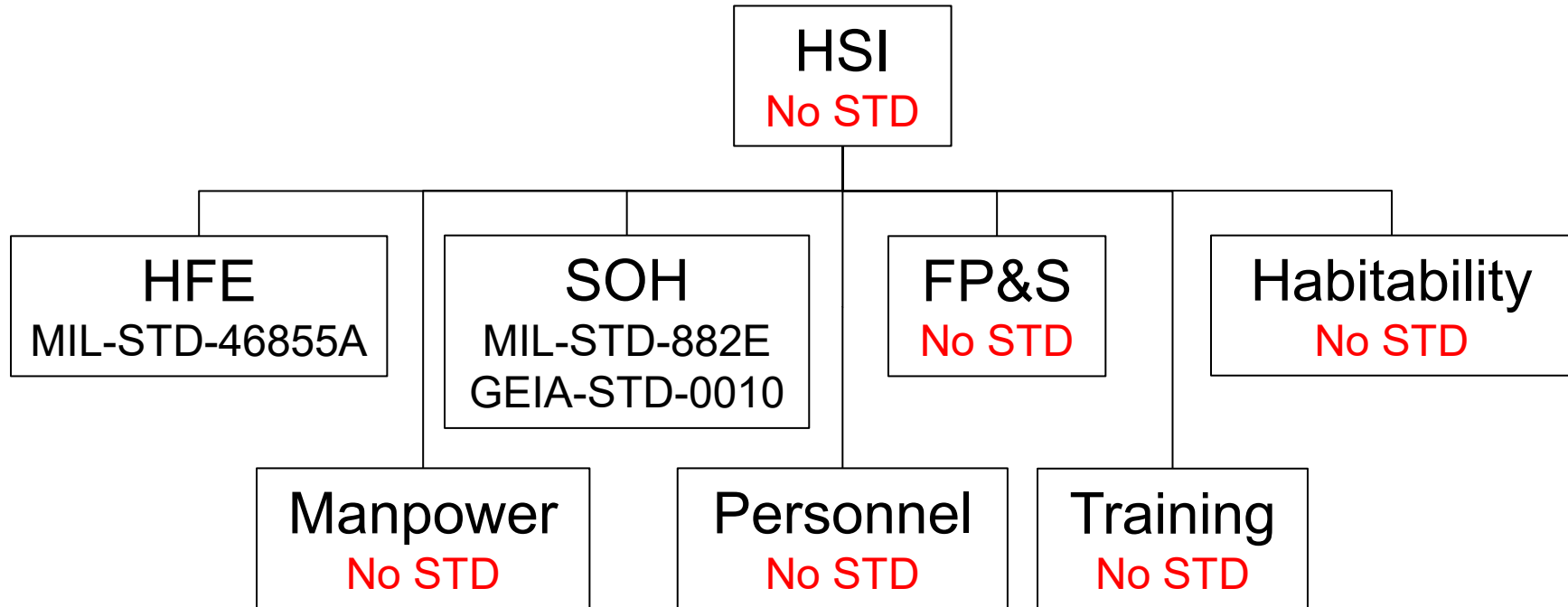
DoD HSI Background

- The term “MANpower and PeRsonnel INTeGration” (MANPRINT) was coined in 1984 by General Richard H. Thompson, Commanding General of the U.S. Army Materiel Command. **[A true HSI lead!!]**
- MANPRINT) was formally established by Army Regulation 602-2 on its effective date of 07 October 1994.
- The US Air Force applies HSI to systems acquisition programs with the USAF HSI Handbook (2009), but does not have a binding policy in place, to date.
- The Navy established their HSI policy around 2012 (+/-) and updated it with OPNAVINST 5310.23A, 17 October 2017.
- In 2012, the DoD HSI Standards Working Group was established by Mr. Owen Seely (USN) to explore alternative methods to develop an HSI Standard for industry. Steve Merriman joined as an industry-rep member.

Pre-2013 Summary

- DoD requires HSI for systems acquisition programs.
- The US Military services have regulations, instructions and/or handbooks to guide the application of HSI on acquisition programs.
- No overarching HSI standard for industry.
- Only some of the HSI domains have contractually enforceable standards.

The State of DoD HSI Process Standards Circa 2013



G-45 HSI Committee Work in HSI Standards

- In 2013, the DoD HSI Standards WG began exploring an HSI Standard through conducting gap analyses and business case assessments, which determined that a DoD-recognized industry HSI standard was needed.
- In 2015, the Defense Standardization Program Office (DSPO) elicited proposals from Standards Developing Organizations (SDOs).
- SAE G-45 was selected as the lead developer in March 2016 (just a few months after the G-45 committee became part of SAE International).

G-45 HSI Committee-Developed HSI Standard

- This began a three-year development process that included participation of more than 100 DoD HSI and HSI Domain practitioners and culminated in the publishing of SAE-6906, Standard Practice for Human Systems Integration, in February of 2019.
 - The DoD adopted SAE6906 as their preferred method for contracting for HSI on system acquisition programs in September 2021.
 - Office of the Under Secretary of Defense, Research and Engineering has provided licenses for government entities to gain access to the HSI Standard.

Analysis of HSI Domain Standards

- Following publication of SAE6906, the G-45 Committee analyzed the extent to which standards existed for all seven of the HSI domains
 - MIL-STD-882 for Safety and MIL-STD-46855 for HFE, existed and have been used successfully by acquisition programs to implement these HSI domain activities into system development contracts.
 - At the time, it was assumed that the Training domain was adequately covered by the 5-part MIL-HDBK-29612 series and MIL-PRF-29612).
 - The G-45 committee decided to take on the job of developing process standards for the HSI domains that had none: Habitability, Survivability, Manpower, and Personnel.

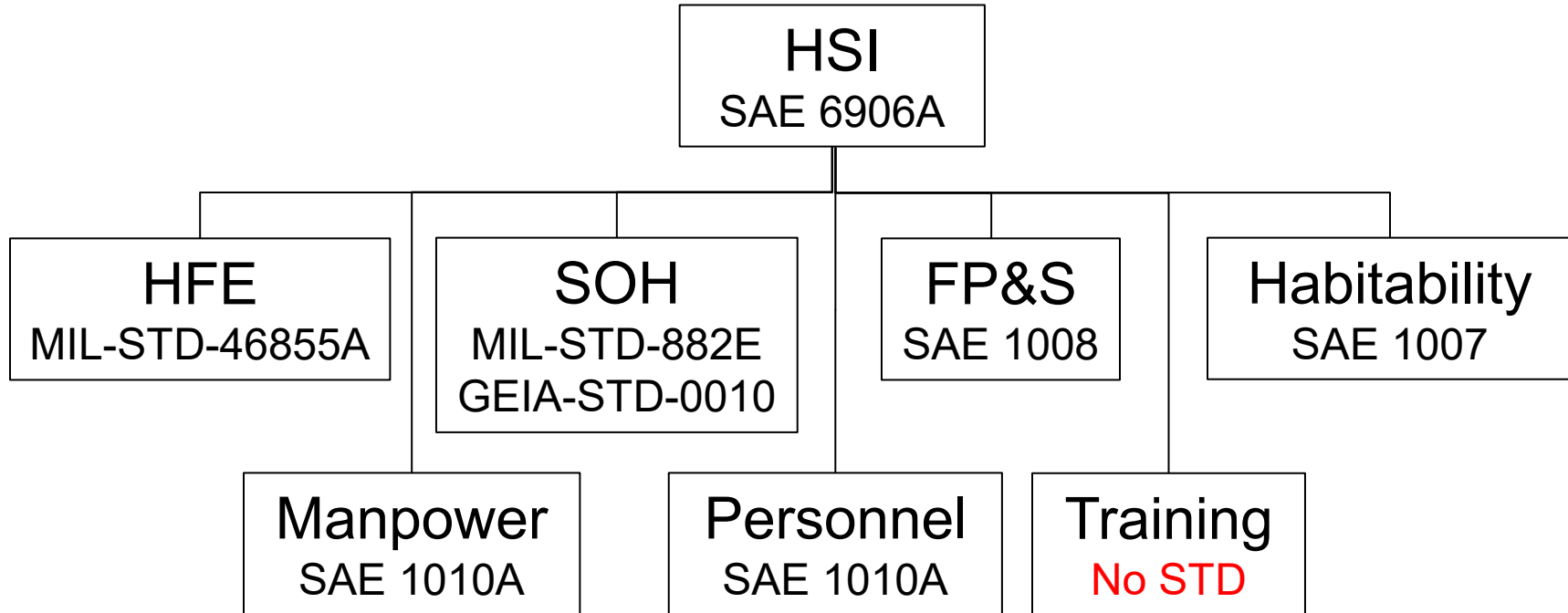
G-45-Developed HSI Standards

- **SAE1010** - Standard Practice for Manpower and Personnel (Issued 18 September 2020)
- **SAE1007** - Standard Practice for Habitability (Issued 14 September 2021)
- **SAE1008** - Standard Practice for Force Protection & Survivability (Issued 14 April 2022)

Revisions of G-45 HSI Standards

- With the release of DoD INSTRUCTION 5000.02 Operation of the Adaptive Acquisition Framework (AAF), effective 23 January 2020, the G-45 committee recognized that these HSI standards should have guidance on how to implement the standards within the AAF construct.
- This led to the revision of the four HSI /Domain standards to include guidance on what material is relevant for each of the AAF pathways.
- Updates to SAE6906A and SAE1010A were published in December 2023; SAE1007A in May 2024; SAE1008A is currently still in process.

The State of DoD HSI Standards Today



G-45 HSI Training Domain Standard Exploration

- A Training Domain process standard still remains a “Question”.
- Members of the G-45 posed a question as to whether there are any training standards or specifications called out in acquisition contracts for DoD programs.
- G-45 reached out to Training Domain leads across the DoD services with the query.

G-45 HSI Training Domain Standard Exploration

- Several sources were cited in reference to training systems development with FAA Part 60 and ARINC 450-1 indicated as primary standards; however, there was no consolidated single-source identified as the comprehensive authoritative DoD standard.
- In response, the G-45 recently established a training standard Working Group to explore the identified sources and to determine if the DoD training community would see benefit in developing a single DoD-wide Training process standard.

Future G-45 HSI Activities

- Submit revisions of all four HSI/Domain standards to the DoD for adoption.
- Continue Training Working Group meetings to determine the need for a Training process standard.
- Establish a Model-Based Systems Engineering WG for a new standard
- Complete development of the DFM Standard (SAE 1009).
- Support the DoD in:
 - Updating/Revising MIL-STD-46855A, Process standard for Human Engineering
 - Completing and publishing a DoD HSI Handbook
 - Updating/Revising MIL-STD-1472H, Human Engineering Design Criteria Standard

Questions ?

Biographies

- **Mr. Stohr** has been serving as a defense contractor, in Human Factors and Systems Engineering, for over 26 years with the last 24 out of Dahlgren, VA. He has provided lab and acquisition support to the Air Force, Marine Corps, and sea and air components of the Navy. His focus areas of interest include HF design evaluations (MIL-STD-1472-based), HSI, requirements writing, user performance testing, and standards writing. He is the current chair of the SAE International G-45 HSI Committee.
- **Mr. Merriman** has fifty plus years of experience as a human factors engineering (HFE) / human systems integration (HSI) practitioner with the US Navy, DoD and Boeing. He has provided support to more than 65 acquisition programs, including the NASA Space Shuttle, Army ground combat vehicles, Army unmanned vehicles, missile systems, and more than 50 military aircraft - including fighter, bomber, attack, electronic warfare, surveillance and reconnaissance, special mission, intelligence, helicopter, vertical lift, transport, trainers, and ASW.

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