DATA ITEM DESCRIPTION

Title: Human Engineering Design Approach Document - Maintainer

Number: DI-HFAC-80747C   **Approval Date**: 20161104
AMSC Number: 9741   **Limitation**: N/A
DTIC Applicable: No   **GIDEP Applicable**: No
Preparing Activity: MI   **Project Number**: HFAC-2016-002
Applicable Forms: N/A

Use/Relationship: The Human Engineering Design Approach Document-Maintainer (HEDAD-M) describes the equipment and software that interface with maintainers, excluding depot-level maintenance. It also describes the maintainer-related software used by maintainers. This data item description (DID) provides a source of data to evaluate the extent to which equipment and software interfacing with maintainers meets human performance requirements and human engineering criteria; it may also serve as source data for the development of technical publications, maintenance training, and supportability engineering. The Maintainer Interface Matrix provides summary information regarding incorporation of human engineering features into system design in support of contract milestones (e.g., Preliminary Design Review, Critical Design Review).

a. For the purposes of this DID, "maintainer" is a general term which includes any person that performs a maintenance task (e.g., a driver changing a flat tire, a crewmember filling fluid levels).

b. This DID contains the format, content, and intended use information for the data deliverable resulting from the work described in MIL-STD-46855 and applicable tasks delineated in the solicitation.

c. This DID supersedes DI-HFAC-80747B.

Requirements:

1. Reference documents. The applicable issue of the documents cited herein, including their approval dates and dates of any applicable amendments, notices, and revisions shall be as specified in the contract.

2. Format. The format of the main body of the HEDAD-M shall be contractor-selected. The summary-level attachment described in 3.3 shall be in a spreadsheet, table, or database format. Unless effective presentation would be degraded, the initially-used format arrangement shall be used for all subsequent submissions. Revisions shall be clearly indicated in a manner consistent with standard editorial practices.

3. Content. The HEDAD-M shall describe the maintenance-related characteristics, maintainer interfaces, layout, maintainer access, and installation and removal of all equipment and software having a maintainer interface, and the maintainer tasks and actions associated with the equipment and software for the system being developed or modified. The HEDAD-M

shall describe the extent to which the requirements and applicable human engineering design criteria (e.g., MIL-STD-1472) have been incorporated into the design, layout, and installation of equipment and software that have a maintainer interface, and include results from maintainer task analysis, if available, as part of the rationale.

3.1 For existing systems, the HEDAD-M shall apply only to the new and modified hardware and software maintainer interfaces. For existing systems, the HEDAD-M shall describe maintainer interfaces, access, and tasks that are being developed or modified to meet the contract requirements, and how the new and modified maintainer interfaces are integrated with the design. For new systems, the HEDAD-M shall describe all maintainer interfaces, access, tasks and how maintainer interfaces are integrated with the design.

3.2 The HEDAD-M shall provide a list of each item of equipment that has a maintainer interface. The list shall include the information described in the following paragraphs for each item. This information can be provided in separate sections, or organized by unit of equipment (e.g., weapon replaceable assembly (WRA), line replaceable unit (LRU) or software module) across one or more topics. Software interfaces for maintainers that are incorporated into a WRA or LRU shall be described with the item.

3.2.1 <u>Name, purpose and maintenance required</u>. Provide the name of the item, a brief statement of its purpose, and the types of maintenance it requires (e.g., troubleshoot, remove/replace, inspect, test, or repair).

3.2.2 <u>Depiction</u>. For equipment, provide drawings, photographs, or CAD or computer renderings of the item of equipment (LRU or WRA):

   a. by itself, from the top, front, back and side (three-view tri-metrics or exploded tri-metric views).

   b. installed, as the maintainer would normally view it during maintenance.

   For software, provide a screen capture or storyboard rendering of the user interface with its embedded menu structures and/or alternate screens.

3.2.3 <u>Location</u>. For equipment, provide the location of the item and information about its access via a drawing, sketch, or computer rendering. Identify the area, compartment or rack where the equipment is located, and the access path (e.g., door, panel). For software, identify the mechanisms for accessing the user interface screen(s).

3.2.4 <u>Maintainability characteristics</u>. Describe the design characteristics of the equipment that influence and facilitate maintainability (see Design for Maintainability chapter in MIL-STD-1472). Identify any design characteristics that impede maintainability. For maintenance software, describe the mechanisms and processes that electronically facilitate fault identification, diagnostics, isolation, built-in-test, correction, and mitigation.

3.2.5 <u>Installation characteristics</u>. List and describe the installation characteristics of the equipment that affect maintainability, including fasteners; clearances; physical access pathway (e.g., door, panel), visual access; and the relationship between accessibility and failure rate (or scheduled maintenance frequency). Identify any characteristics that impede installation or access. For maintainer software, describe how the maintainer accesses the software.

3.2.6 <u>Rationale</u>. Provide a rationale for reaching specific maintenance design and installation decisions, in terms of (as applicable): equipment characteristics (e g., maintenance frequency, criticality, failure rate); maintainer requirements (e.g., personnel selection, training, and skills); maintainer task requirements; environmental considerations; safety, and limitations imposed by the procuring activity or state-of-the-art. Provide any supporting data for specific design and installation decisions (e.g., MIL-STD-1472 criteria; human engineering requirements or guidelines specified in the contract; human engineering studies; trade-off analyses; usability studies; mock-up results; and human engineering test results).

3.2.7 <u>Special tools, support equipment, and aids</u>. Provide a list, description, and depiction of special tools, support equipment, and job aids/devices (e.g., interactive electronic technical manual) required for maintenance of the system. Provide the results of any human engineering analyses contributing to the design of special tools, support equipment, and job aid/devices. Provide rationale why a standard tool is not sufficient and a special tool is required.

3.2.8 <u>Analysis of maintainer tasks</u>. Provide results from available human engineering analyses of maintainer tasks (see critical tasks in MIL-HDBK-1908) as part of the rationale for the layout, design, and installation of items of equipment. Maintainer task analysis information shall include the following, as available: task number (optional); task title; task frequency (for scheduled maintenance actions) or estimated task frequency (based on equipment mean-time-between failure for unscheduled maintenance actions); data source (e.g., drawing number, sketch number, the development or production hardware or software, actual production equipment or software); detailed task sequence (see task analysis in MIL-HDBK-1908); support equipment required; tools required; job aids required; estimated task time; estimated personnel requirements (e.g., number of personnel required, skills and knowledge required); and considerations that reflect specific human engineering requirements incorporated into the design (e.g., maintainer fatigue, potential hazards, safety or protective clothing/equipment required or recommended, access problems, environmental conditions, maintainer communication requirements, special task sequence requirements, labeling). As applicable, task analysis data shall be presented for the following types of maintainer tasks: remove/replace, troubleshoot (fault location), repair, adjust, inspect, service, and test. Clearly identify critical tasks (see MIL-HDBK-1908). If a maintainer task inventory or task analysis exists, it shall be referenced in or appended to the HEDAD-M.

3.2.9 <u>Design changes</u>. Describe any significant maintainability-related design changes made as a result of human engineering recommendations, including the following information: the design prior to change and associated issue(s), human engineering recommendation(s), resulting design change(s), and benefit(s) of design change(s).

3.3 <u>Maintainer interface matrix</u>. The HEDAD-M shall contain a maintainer interface matrix. This matrix shall provide a red-yellow-green "stoplight" summary of available results of human engineering design-for-maintainer analyses (see 3.2.1 through 3.2.9) on each unit of equipment or maintainer interface. Figure 1 provides an example format for this matrix. The HEDAD-M shall provide legends to describe the thresholds used to distinguish scores of red

(unacceptable), yellow (marginal) and green (acceptable). Changes from previous submissions shall be clearly indicated.

Maintenance Interface	Visual Access					Physical Access					Strength	Posture	Tool Swing	Software Interface	Environment	Evaluation Comments	Reference/Link to Analysis
	Connections				Indicators	Connections				Indicators							
	Fasteners	Electrical	Pnuematic	Hydraulic		Fasteners	Electrical	Pnuematic	Hydraulic								
Unit 1	YELLOW	YELLOW	YELLOW	GREEN	N/A	YELLOW	YELLOW	YELLOW	N/A	RED	N/A	YELLOW	GREEN	GREEN	N/A	TEXT	TEXT
Unit 2	GREEN	GREEN	N/A	GREEN	N/A	N/A	GREEN	GREEN	N/A	N/A	YELLOW	GREEN	GREEN	N/A	YELLOW	TEXT	TEXT
Unit 3	GREEN	GREEN	GREEN	N/A	YELLOW	GREEN	GREEN	GREEN	GREEN	YELLOW	GREEN	GREEN	N/A	N/A	N/A	TEXT	TEXT
Unit N	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	GREEN	TEXT	TEXT

Note: This figure is only an example; this matrix should be tailored to meet the needs of the acquisition program.

Figure 1. Example of Maintainer Interface Matrix

End of DI-HFAC-80747C.