

The need for Human Factors Engineering skills

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Throughout its useful lifetime a ship may undergo numerous alterations, changes, additions, or retrofits to its machinery, equipment, systems, or to the vessel's configuration and arrangement. In each of these cases it is incumbent upon those persons responsible for either managing the project, selecting the hardware and software to be added or altered, and/or completing the technical design changes that might be needed to the vessel, to consider whether the changes will impose the need for Human Factors Engineering (HFE) to be included in the project. To make the proper decision requires certain skills and knowledge of HFE by those responsible for, and design of, the equipments, systems and machinery to be included in the project.

The first three skill sets needed by the person(s) responsible for the project are: 1) a sufficient knowledge of the HFE discipline to understand how the changes in hardware and software, or ship configuration or arrangement may directly impact how safely and efficiently the ship's crew performs with the changes, 2) knowing how to determine if HFE inputs are needed for the specific project they are involved with, and 3) knowing if, when and how outside HFE assistance is needed.

For those without the knowledge of the HFE discipline, or who need assistance in making the HFE decisions, there are several publications that sufficiently describe what constitutes HFE and what "human elements" are associated with HFE in a shipboard setting (1,2,3,4).

As for whether the specific project they are involved with needs HFE input, answering the following questions as they apply to their specific ship project, can be a good approach toward deciding whether or not to include HFE in any ship alteration or upgrade project (5):

- 1 Will the type of personnel involvement or the philosophies related to operation or maintenance of the new design or equipment differ substantially from the current practice of the company?
- 2 Will the new design, equipment, instrumentation, etc., introduce new technologies or automation and impose new tasks and skill requirements on the operators/maintainers not previously required?
- 3 Is there an opportunity to decrease operator/maintainer levels of error through improved design?
- 4 Will the design be operated/maintained by individuals not normally assigned to work on the facility (e.g., outside personnel, contractors, vendor equipment repair specialists)?
- 5 Is one of the objectives of the new project to reduce manning levels?
- 6 Will the new design be used by personnel from a culture or geographic part of the world different than the individuals doing the actual designing and/or construction?

- 7 Will the new design be operated or maintained by both men and women?
- 8 Will the new design be provided with equipment or systems with which the operators/maintainers have had little or no previous experience?
- 9 Is one of the goals of the new design to reduce accidents or incidences that have occurred on other facilities?
- 10 Will the new design be significantly more complex than, or different from, any previously operated by the company?
- 11 Is the new design a result of issues associated with HFE?
- 12 Is one of the goals of the new project specifically to reduce operating/maintenance costs?
- 13 Does the company have a specific corporate mission to enhance safety and quality of the work environment for its employees?
- 14 Has the company had any previous unfavorable rulings from regulatory agencies on issues of employee safety, pollution control, or facility design based on HFE issues?

A YES answer to one or more of the questions would indicate that there should be some HFE involvement: The more YES answers, the greater should be the HFE effort.

The exact amount and type of HFE involvement can only be determined by knowing more about the proposed project other than there were YES answers to one or more of the above questions. However, by using a qualified HFE professional with ship design experience (see Section 7.6 of Reference # 5 for qualifications and experience requirements), the amount and type of HFE support can be quickly ascertained.

The fourth skill set needed by those responsible for ship re-work projects is a working knowledge of an acceptable HFE based ship design standard that can be applied to the new project. Two standards that are now used extensively for ship design projects are those produced by the American Bureau of Shipping (ABS) and the American Society of Testing and Materials (ASTM) (6, 7). It is highly likely that either of these would be appropriate to some degree for most ship re-work projects.

It is understood that not every ship alteration or upgrade project will require HFE involvement. But it is also understood that every ship alteration or upgrade project should at least be reviewed for possible HFE involvement. Thirty years of experience in incorporating HFE design standards into all types of ship design projects clearly demonstrates that inclusion of HFE in the design process reduces the chances and consequences of human induced errors on ships at sea.

References

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