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MSC-MEPC.2/Circ.13  
8 July 2013

**GUIDELINES FOR THE APPLICATION OF THE HUMAN ELEMENT  
ANALYSING PROCESS (HEAP) TO THE IMO RULE-MAKING PROCESS**

1 The Maritime Safety Committee, at its sixty-ninth session (11 to 20 May 1998), and the Marine Environment Protection Committee, at its forty-second session (2 to 6 November 1998), approved the *Interim Guidelines for the application of Human Element Analysing Process (HEAP) to the IMO rule-making process* (MSC/Circ.878-MEPC/Circ.346).

2 The Maritime Safety Committee, at its seventy-fourth session (30 May to 8 June 2001), and the Marine Environment Protection Committee, at its forty-seventh session (4 to 8 March 2002), approved the *Guidance on the use of human element analysing process (HEAP) and formal safety assessment (FSA) in the IMO rule-making process* (MSC/Circ.1022-MEPC/Circ.391).

3 The Maritime Safety Committee, at its ninety-first session (26 to 30 November 2012), and the Marine Environment Protection Committee, at its sixty-fifth session (13 to 17 May 2013), reviewed the aforementioned Interim Guidelines and Guidance in the light of the experience gained with their application and approved the *Guidelines for the application of Human Element Analysing Process (HEAP) to the IMO rule-making process*, as set out in the annex.

4 HEAP is a practical tool designed to address the human element, to be used for consideration of maritime safety and environmental protection issues at IMO. A flow chart is provided in the annex, in accordance with Assembly resolution A.850(20) on *Human Element Vision, Principles and Goals for the Organization*, goal (a) of which states: "to have in place a structured approach for the proper consideration of human element issues for use in the development of regulations and guidelines by all Committees and Sub-Committees". The steps outlined in the flow chart list a series of questions that should be considered to appropriately address the human element in the regulatory development process.

5 These Guidelines are intended to facilitate trial applications of HEAP and should remain in an interim state as long as it is necessary to gain experience. Such trial applications will lead to a greater understanding of HEAP by all parties and identify improvements to the process.

6 An example of the application of HEAP to the IMO rule-making process is attached as an appendix.

7 Member States and international organizations are invited to apply the Guidelines contained in this circular.

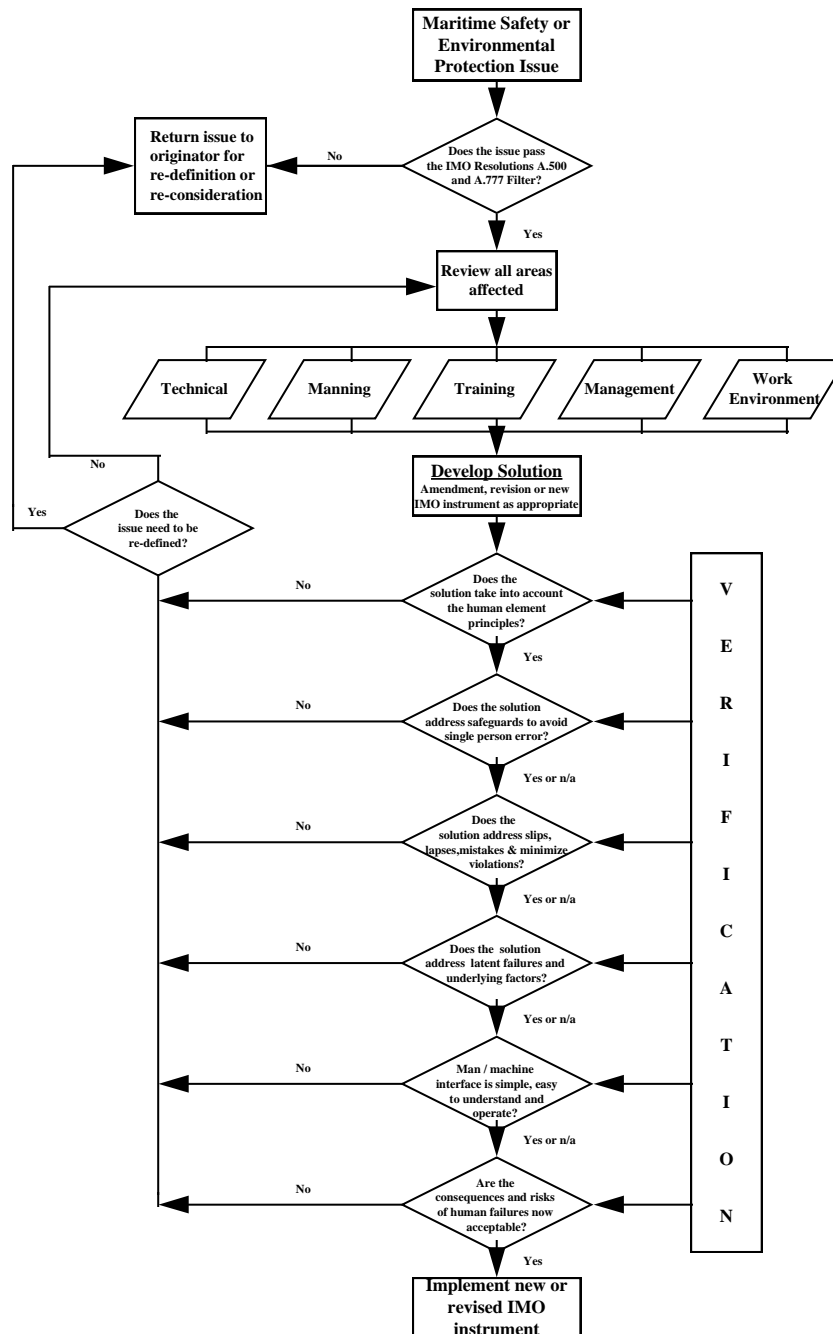
8 The Guidelines superseded the Interim Guidelines, contained in MSC/Circ.878-MEPC/Circ.346, and the Guidance, contained in MSC/Circ.1022-MEPC/Circ.391, as amended by MSC-MEPC.2/Circ.6.

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ANNEX

**GUIDELINES FOR THE APPLICATION OF HUMAN ELEMENT ANALYSING  
PROCESS (HEAP) TO THE IMO RULE-MAKING PROCESS  
REVISED GUIDANCE**

**Human Element Analysing Process Flowchart**



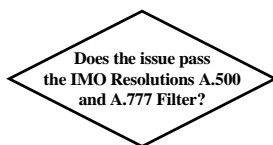
## ASSOCIATED EXPLANATORY NOTES TO THE HEAP FLOW CHART

HEAP is a practical tool, designed to address the human element, to be used for consideration of maritime safety and environmental protection issues at IMO. The flow chart is provided in accordance with Assembly resolution A.850(20) on *Human Element Vision, Principles and Goals for the Organization*, goal (a) of which states: the aim "to have in place a structured approach for the proper consideration of human element issues for use in the development of regulations and guidelines by all Committees and Sub-Committees". The steps outlined in the flow chart list a series of questions that should be considered to appropriately address the human element in the regulatory development process. To assist in the proper application in the use of HEAP, the following general description is provided:

**Maritime Safety or  
Environmental  
Protection Issue**

### 1 Issue identification

The identification of a maritime safety or environmental protection issue is external to HEAP and can be accomplished through several methods, such as the review of existing IMO instruments, the review of casualties or the identification of other marine circumstances which may cause concern. The issue identification process should result in a clear, concise issue statement and a determination of the parameters containing who, what, where, how, when, to what extent and an appropriate description with supporting information.



### 2 Is IMO action appropriate?

When seeking to resolve the identified issue, it must be decided whether or not it is appropriate for IMO to be involved and whether a solution developed by IMO is the only action which may be taken. In some cases, it may be more appropriate to refer the matter to another organization or group requesting that they develop a solution not requiring the development, or change to, IMO instruments.

**Review all areas  
affected**

### 3 Review all areas affected

If IMO action is appropriate, revisions to and application of existing IMO instruments should be the first consideration. Where the Organization determines the existing instruments or initiatives cannot be applied to resolve the issue, then development of a new IMO instrument(s) should be considered. As a first step to applying HEAP, it is important to ensure that if the proposal requires additional regulations in other areas such as technical, manning, education, management, or working environment, that these areas receive due consideration to ensure all aspects of the human element are fully covered.



#### 4 Human element checklist

The following checklist is provided for use in verifying that the human element has been adequately considered. It consists of five subject areas that should be considered when using this tool. It must also be recognized that these lists are intended as a practical guide and are neither exhaustive nor necessarily applicable to all situations.

##### Technical

(The vessel and/or its equipment)

- Design
- Ergonomics
- Manufacture/construction
- Installation
- Initial and periodic testing
- Approval
- Maintenance
- Repairs
- Modifications
- Renewals
- Expected marine environment<sup>1</sup>
- Operations<sup>2</sup>

##### Manning

(Master and crew of the vessel)

- Qualifications
- Number of crew members
- Composition of crew
- Culture<sup>3</sup>
- Working Language
- Medical Conditions
- Competence

##### Training

(Ashore and aboard)

- Basic Safety Training
- Familiarization
- Drills
- Extended safety training
- Training of personnel ashore

##### Management

(Ashore and aboard)

- Policy
- Safety culture
- Motivation
- Communication links
- Responsibility
- Authority
- Work planning
- Contingency planning
- Emergency response
- Manuals
- Procedures
- Instructions
- Work methods
- Checklists
- Education and Training

##### Work Environment/conditions

(aboard ship)

- Hazardous materials
- Man-machine interface<sup>4</sup>
- Personnel protection
- Physical hazards
- Hours of work
- Hours of rest
- Fatigue
- Estimated workload<sup>5</sup>
- Actual marine environment
- Living conditions

<sup>1</sup> Is interpreted to mean marine environment preconditions (e.g. sea state, air temperature).

<sup>2</sup> There are some technical regulations which have an influence on operations (e.g. MARPOL, regulation 26).

<sup>3</sup> Is interpreted to mean personnel culture (e.g. multinational crew).

<sup>4</sup> Is a technical issue which has implications on the work environment.

<sup>5</sup> Workload including watchkeeping, cargo duty, maintenance and possible breakdowns.

**Develop Solution**

Amendment, revision or new  
IMO instrument as appropriate

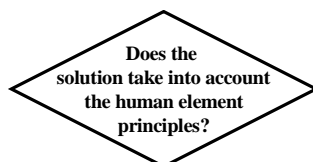
## 5 Develop necessary revisions or new instruments

After area identification has been completed, the necessary revisions should be undertaken with a focus on ensuring the human element principles have been taken into account.

### **VERIFICATION**

## 6 Is the issue resolved?

Before accepting any solution to an issue, a process should be undertaken to verify that the safety concerns identified in the original safety issue were addressed. The following series of questions is designed to ensure the proposed solution takes into account the various aspects of the human element that contribute to unsafe acts and accidents. By determining the impact of the solution on the parameters who, what, where, how, when, and to what extent), the degree of success can be established and it can be determined if the issue has been resolved, in part, or not resolved.

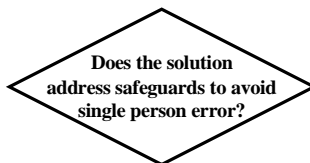


## 7 Human element principles (Assembly resolution A.850(20))

Any proposed solution must take into account the human element principles adopted by the Organization:

- The human element is a complex multidimensional issue that affects maritime safety and marine environmental protection. It involves the entire spectrum of human activities performed by ship's crews, shore-based management, regulatory bodies, recognized organizations, shipyards, legislators and other relevant parties and they need to cooperate to address human element issues effectively.
- The Organization, when developing regulations, should honour the seafarer by seeking and respecting the opinions of those that do the work at sea.
- Effective remedial action following maritime casualties requires a sound understanding of human element involvement in accident causation. This comes by the thorough investigation and systematic analysis of casualties for contributory factors and the causal chain of events.
- In the process of developing regulations, it should be recognized that adequate safeguards must be in place to ensure that a single person error will not cause an accident through the application of these regulations.

- Rules and regulations addressing the seafarers directly should be simple, clear and comprehensive.
- Crew performance is a function of individual capabilities, management policies, cultural factors, experience, training, job skills, work environment and countless other factors.
- Dissemination of information through effective communication is essential to sound management and operational decisions.
- Consideration of human element matters should aim at decreasing the possibility of human error as far as possible.



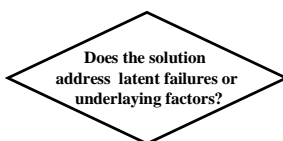
## 8 Single person error

A single person error must not lead to an accident. The situation must be such that errors can be corrected or their effect minimized. Corrections can be carried out by equipment, individuals or others. This involves ensuring that the proposed solution does not rely solely on the performance of a single individual. An example is a pilot conning a ship without any support from the master or officer of the watch.



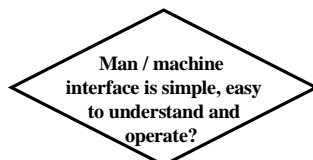
## 9 Slips, lapses, mistakes and violations

Slips are errors relating to the execution of day to day tasks where there has been inattention or over attention. Lapses are similar to slips where forgetfulness or absentmindedness cause errors. Mistakes may result from errors of judgement, calculation or interpretation of information. Violations involve the deliberate breach of accepted practices and procedures, guidelines, operating instructions, or regulations. Violations may be the result of taking short cuts to save time or effort. Although inherently unsafe, such practices may become institutionalized and increase the risk threshold and the probability of an accident. Violations may be the result of poorly written guidelines or regulations and the failure of management to effectively audit practices and procedures on board vessels.



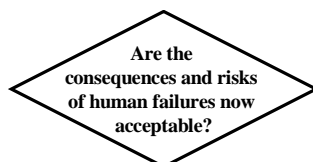
## 10 Latent failures or underlying factors

Latent failures or underlying factors relate to pre-existing conditions that may exist within systems or organizations, which given the right combination of circumstances, may contribute to an unsafe situation. They include such conditions as, organizational, design, maintenance, communication failures, etc.



## 11 Man/Machine Interface

Involves the compatibility of ship design and equipment design with the individuals that work on a ship or use the equipment. The man/machine interface includes issues such as human input aspects, easily understood information display and the interaction between the human operator and the 'machine'. The aim is to achieve uniform design and layout, to use internationally recognized symbols on equipment controls, using established ergonomic principles, criteria and requirements, combined with appropriate education and training.



## 12 Consequences and risks

The final step in the process is to make sure that the consequences of human failure have been addressed, and that the Organization will accept any remaining consequences/risks. If not, the Organization should re-evaluate the proposed solutions until an acceptable solution is reached.

**Implement new or revised IMO instrument**

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## Appendix

### AN EXAMPLE OF UTILIZING HEAP IN THE IMO RULE-MAKING PROCESS

1 The Sub-Committee on Fire Protection, while undertaking a comprehensive review of SOLAS chapter II-2, used HEAP for determining the contents of regulations II-2/14 "Operational readiness and maintenance", II-2/15 "Instructions, onboard training and drills" and II-2/16 "Operations" and found that HEAP was a useful tool to identify areas which should be taken into account concerning operation and maintenance of fire safety systems and fire drills.

2 HEAP was used within the correspondence group on the comprehensive review of SOLAS chapter II-2.

3 Regulations 4 to 13 of SOLAS chapter II-2 require fire safety construction, arrangement and equipment on board ships, based upon the following:

- .1 prevention of fire;
- .2 detection of fire;
- .3 suppression and control of fire; and
- .4 escape from fire.

Then these regulations were screened using HEAP to determine which actions were to be taken by crew and management. Through the process set out in paragraph 4 of the annex (Human element checklist), details of the following measures relating to fire safety construction, arrangement and equipment were identified:

- .1 operational readiness;
- .2 maintenance;
- .3 instructions; and
- .4 training and drills on board.

4 The results were reviewed in the correspondence group and taken into consideration when drafting regulations 14, 15 and 16 of SOLAS chapter II-2.

5 The Sub-Committee reviewed and endorsed the outcome.