



SUB-COMMITTEE ON STANDARDS OF
TRAINING AND WATCHKEEPING
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Agenda item 15

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ANY OTHER BUSINESS

Benchmarking of Seafarers

Submitted by India

SUMMARY

Executive summary: Crew performance has been a subject of international debate ever since human and organizational error has taken center stage as the single most cause, responsible for accidents. Many efforts are being made by the IMO, flag states and international institutions to find a viable solution that is globally effective and yields uniform results. Benchmarking is such a solution proposed. It is a proven concept in the industry and may be "The" solution to crew problems. This paper illustrates, in light of the Indian administration experience, what is in practice, the options available in the classical mode and the methodology for effective benchmarking to enhance the effectiveness of STCW Code.

Action to be taken: Paragraph 3

Related documents: Annexed text

1 Consequent to the recommendations on guidelines of the STW Sub-Committee in its thirty-first session approving the draft amendment to Section B-1/9 of the STCW Code this paper, given in the annexed text, brings out the specific need for ascertaining and coding crew performance, not only at entry level but at all levels of Certificates of Competency and Watch-Keeping.

2 The Government of India is of the opinion that concepts of Bench Marking, as given in the Annexed text, is necessary, at various levels of Certification and functional levels of Competency to ensure optional and uniform performance of seafarers leading to enhanced Safety.

Action requested of the Sub-Committee

3 The Sub-Committee is invited to take note of the above, consider the annexed text and decide as appropriate.

ANNEX

BENCHMARKING OF SEAFARERS

Introduction

The Seafarer today is very different from the ancient mariners of yore. The difference is ever widening from that of social background to education and competence. STCW 78 and the Code of 95 have formalized the methodology, by which raw inputs become trained seafarers. The levels of competence are clearly defined now and normally if the flag country adopts a systematic recruitment, training, certification and experience programme, the end result should be satisfactory. During the four stages of recruitment, training, certification and experience, some levels are overemphasized and others are not so keenly pursued. Invariably this results in a less than complete seafarer, deficient in many key aspects.

1 Studies in the area of crewing problems and experience have shown that even if STCW 78 read along with STCW 95 is implemented in letter and spirit, the Certificate of Competency in itself will not present a reliable and efficient man. There is no mechanism at present to categorize seafarers in terms of certain attributes other than by a Certificate of Competency. In effect, the underlying principle of the 4-stage method is to refine and enrich a seafarer in most operative or managerial situations, in the following areas:

- 1.1 knowledge;
- 1.2 logic and interpretation;
- 1.3 comprehension;
- 1.4 reaction.

In spite of these efforts and practices, human error the discreet form of Human and Organizational Error does take place. There can be many specific reasons for an accident, but it is generally agreed that 60% of errors are attributed to HOE. There are also multitudes of approaches towards minimizing HOE. In order to have optimum reliability of ships structure, equipment and operation and minimal HOE it is imperative that the crew level of performance (LOP) is enhanced. LOP is the ratio of reported levels of performance with respect to certain known parameters and the expected levels of performance with reference to the same parameters.

2 At present the vessel certification system along with standardization practices during design and construction with the combined inputs of IMO, ILO, flag-state, classification societies and other statutory bodies has yielded satisfactory results. STCW 78 and Code of 95 has quantified the objectives of an ideal seafarer. Quality-wise there are still some areas, which need improvement. Some factors, which are a paradox in defining **"Safe ships and cleaner oceans"** are listed below:

- 2.1 The LOP of crew, even from the same flag state continues to vary considerably.
- 2.2 Insurance sector does not recognize crew competence or LOP.

- 2.3 The combinations of a low LOP of crew and barely certified ships would be difficult to identify in terms of factors of trade or insurance.
- 2.4 A good vessel with high reliability factors built in, could have a mixture of crew having varied LOP which could be a weak-link or feeder for human error.
- 2.5 Ethnic manning of crew can create low LOP.
- 2.6 Adverse situations, environments, work cultures, company attitudes can cause low LOP.

3 The paradox is that, the above factors do not reflect in any manner to influence the following:

- 3.1 The insurance of vessels or cargo.
- 3.2 The vessels certification to an extent where it can become clearly discernible.
- 3.3 The vessels normal operation till such time, an accident takes place.
- 3.4 The safety of life on board (SOLOB) till such time, an accident takes place.
- 3.5 The reliability of a vessels operation till such time the schedules are missed and breakdown frequencies increase.

4 The age old adage that a **"ship is as good as the men who run it"** is true. The crew forms the nucleus of a ships operation, maintenance and safety. Proliferation of seafarers from various nationalities has brought to the fore, myriads of problems. The levels of Certificates of Competency vary widely and so is the degree of training and experience. In addition to this, there are certain factors that are common elements to all seafarers and they are:

- 4.1 Fatigue, Body Rhythms and sleep.
- 4.2 Fitness and performance.
- 4.3 Visual and audiovisual.
- 4.4 Motion of vessel.
- 4.5 Communication between seafarers. (language and speech).
- 4.6 Attitude and persuasion.
- 4.7 Effects of ergonomics and design.
- 4.8 Electromagnetic radiation effects.
- 4.9 Education and application.
- 4.10 Overbearing load of documentation and formalities.

4.11 Exposure to inspection and survey psychosis.

4.12 Job insecurities.

4.13 Insulated environments

5 In a study conducted recently it was observed that out of 10 randomly selected crew in deep sea fishing vessels the ratio of crew with high LOP and very low LOP was 2: 2: 4: 1. An insight into any merchant vessels crew composition would not be very different. This is owing to various factors such as:

5.1 Management companies employing through crewing agencies.

5.2 Dominance of crew on lesser wages.

5.3 Dominance of crew with greater availability.

5.4 Dominance of crew from syndicates.

The emphasis on such type of crew, stems out of an underlying principle that crew is required to meet statutory requirements which translates into competencies. Since levels of reliability and automation as well as in-built safety in equipment, and systems has reached very high, a substantial degree of human error is already factored in. The malaise lies in the Human and Organizational error of which Human error is a component. If the LOP of 50% of the crew is low, than HOE will surely manifest itself in an accident. Research has shown that in ships, a maximum of 60% of HOE can exist in all aspects of shipping put together. If even 30% of crew is low on LOP, that translates into 50% of HOE, which further translate into a major cause for a serious accident. Low LOP in 30% of a mixed crew is not uncommon. With mixed crew and harsh conditions of service, the multiplying effect is imaginable.

6 There has been in practice a "**safety through redundancy concept**" which is the "**raison de'tre**" of multiple crew philosophy concept. If a "**team concept**" is pursued, more as a pragmatic approach, some negative aspects of Human Factors would be reduced. Some other useful inputs by which the LOP factor can be enhanced, would be:

6.1 Human Factors Awareness courses.

6.2 Factoring in of Human consultants, supervisors and in house specialists into management, operation etc.

6.3 Integrating indication of Human factor as a form of safety index.

To increase LOP, it is necessary to identify SLOP - specific level of performance and OLOP - overall level of performance. SLOP could be high with a particular set of crew but low on OLOP.

Experience has shown that OLOP is much more beneficial in reducing HOE and thus accidents. Studies in evaluating OLOP crew from various backgrounds, experience and operational environments in the Indian subcontinent is evaluated with the use of a crew evaluation method based on data flow diagram in Figure 1.

7 Action 1 and 2 - are the calculations of ships and of the crews availability for maintenance. An assessment of crews and ships capacity in terms of availability of operations is the first step. For the ship the capacity is the total operational time. These two are used to calculate the availability of maintenance, by which is meant the number of hours total operational time. These two are used to calculate the availability of maintenance by which is meant the number of hours the crew or the ship and her systems are available for the execution of maintenance actions. The availability is thus compiled from the:

- 7.1.1 crew abilities;
- 7.1.2 crew functions, job descriptions;
- 7.1.3 crew task structures;
- 7.1.4 characteristics of the vessel;
- 7.1.5 envelopes of performance of vessel and its duties.

7.2 Action 3 - would combine the two availability figures to calculate the total availability of resources in terms of systems of ships and the crew for execution of maintenance. This total is obtained by consolidating crew's and ship's availability into a single availability for maintenance.

7.3 Action 4 - calculates the maintenance workload. As Figure 1 would show workload is compiled from systems availability for maintenance, the recorded and the estimated workloads. This is done in order to minimize the estimation error, about the size of this workload.

7.4 Action 5 - produce the joint availability as compared with workload. This action finally tunes the crew, and results in the preferred crew OLOP.

8 The OLOP is devised as a signature index value, which uses specific values necessary to benchmark the seafarer. It is assumed with a fair degree of approximation that vessels mechanical systems reliability and its availability or rather its LOP can be predicted under various condition of ship operations which are stated as follows:

- 8.1 Docking - all states while proceeding to, at and from a repair yard, dock, etc.
- 8.2 Port - all states while, at port.
- 8.3 Pilotage - all state while proceeding to, departure from port, and areas of pilotage.
- 8.4 Anchorage - all states of anchorage.
- 8.5 Sea voyage - all states of sea voyages.

The LOP for crew is however, dependent on factors related to HOE, which are heavily dependent on:

- 8.6 Human Generic factors.
- 8.7 Human efficiency, determination criteria.

- 8.8 Reaction to schedule, emergencies, living criteria etc.
 - 8.9 Workload balancing.
 - 8.10 Job definition and conflict in support, operational and management duties.
 - 8.11 Attitude and perceptions.
 - 8.12 Assumed work culture.
 - 8.13 Job related market syndromes.
- 9 It can be thus seen that benchmarking is inevitable for three different reasons:
- 9.1 To enhance global competition at high levels of quality crew.
 - 9.2 Quality incentives and awards that encourage healthy competition, which are bench-markings key components, including principles of self-assessment.
 - 9.3 To give a quantum jump to the principle of ISM whose "Achillesheel" is crew performance and credibility.
 - 9.4 Benchmarking of crew will enable a flag and the IMO in general to start looking outward in terms of a quality product, which has measurable modes. There is however a need to decide the process which is specific to crew that needs benchmarking, and they are:

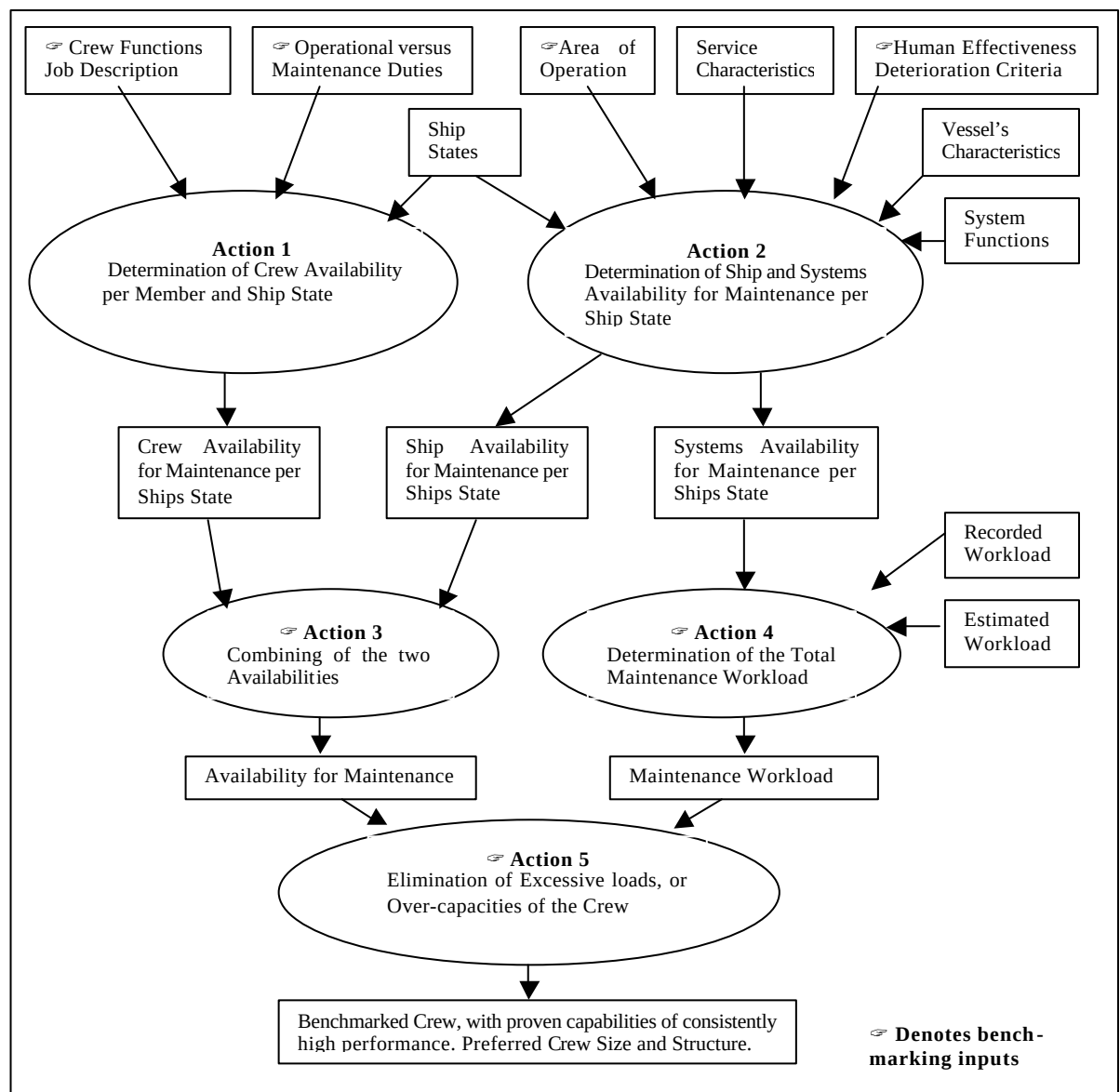


Figure - 1 Crew organization tuning, in view of the maintenance workload

Crew competencies in terms of:

- 9.4.1 Physical abilities
- 9.4.2 Mental abilities
 - 9.4.2.1 Knowledge
 - 9.4.2.2 Comprehension and interpretation
 - 9.4.2.3 Logical analysis and reasoning
 - 9.4.2.4 Reaction to situations

9.4.3 Beliefs and attitudes

9.4.4 Overall discipline

9.5 Assess - all the specifics mentioned in 9.4 or have the means to assimilate those mentioned in 9.4 under normal, adverse and simulated conditions.

9.6 Identify the weak areas, perception and abilities that need improvement.

9.7 Crew training in terms of:

9.7.1.1 Knowledge imparted

9.7.1.2 Proficiencies imparted

9.7.1.3 Skills imparted

9.7.1.4 Streamlining beliefs and attitudes

9.7.1.5 Inculcating discipline

10 The entire process is dynamic and needs to have data inputs at all stages which are identified as follows:

10.1 Phase 1 - period of apprenticeship

10.2 Phase 2 - period of sea services prior to certification

10.3 Phase 3 - period of sea services with support or operational level of certification

10.4 Phase 4 - Period of sea service with management level certification

11 The data on crew comes from an assorted list of documents such as:

11.1 Watch keeping certificates suitably modified to reflect different abilities.

11.2 Continuous Discharge Certificates to reflect on his virtues.

11.3 ISM related returns on crew performance.

11.4 PSC reports on performance.

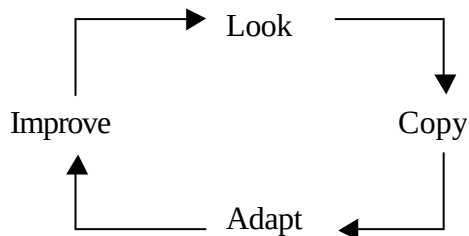
11.5 Company reports, administration findings, insurance company reports etc.

There is an absolute need to collect data, analyse and understand the internal process, which is prevalent with each administration.

The next step is to identify the ideal requirements or the optimum qualities and standards. These standards are well laid out in some defense, aviation, security services, where specialized aspects of a persons capabilities are needed. Most of these qualities are now available in print and are being practiced and evaluated on a regular basis. Optimized values would be got from as

diverse institutions as hotel, financial institutions, medical institutions etc. Such expertise to identify the standards can be provided by institutions worldwide and specially those who work closely with IMO.

12 The process is to continuously adapt and improve on a closed cycle as shown in Figure 2.



This is the dynamic process and defines the stages of making it happen. Usually the stages of achieving this, in the industry, are well laid down. The shipping industry could do with about eleven stages by all fair standards. It is necessary to involve external agencies or partners, which interact with the following perspectives:

Figure - 2 Benchmarking

- 12.1 Internal - amongst its various sections and institutions.
- 12.2 Competitive - on international basis.
- 12.3 Functional - with respect to the best in similar field of actions.
- 12.4 Generic - Compares with the best from all other industry grouping.

13 For this entire exercise to be an unqualified success the following are absolutely necessary:

- 13.1 Senior management support.
- 13.2 Understanding ones own process, system, structure.
- 13.3 Teamwork
- 13.4 Planning
- 13.5 Integrating it into flag states national strategy.

One thing is certain, and there should not be any doubt in the fact that benchmarking can only be done by a learned body, society or institution and not by the national administration since the national administration would be heavily preoccupied with Certificates of Competency. However it must be unilaterally supported by the administration, as it would mean very high quality crew and international respect. Inputs from the administration can also be provided during stages of training and Certification process.

14 Many flag countries and specialists would question this concept of benchmarking seafarers. Usual accusations have been:

- 14.1 It is just another completion analyses and exercise.

- 14.2 Copying and the taboo associated with it.
- 14.3 Just numbers in another list of efforts.
- 14.4 Only applicable to manufacturing process.
- 14.5 That it can be ever completed is not assured.

The lists at times are endless. If one looks at the STCW 78 convention and the STCW 95 Code, the efforts made by IMO are commendable, in bringing in standardization and quality in the industry. A scope for inspection has also been built in with self-assessment and reporting as a forerunner to a more detailed inspection for continued quality. The guidelines laid down can have varied interpretation, analysis, modifications and ultimately radically different interpretations, because of a key element that needs to be built into the specifications and standards that lay down the defining points of performance. This is the basis of benchmarking for the crew.

15 **"Crew tuning"** is now a crucial form of achieving standards and an integral part of benchmarking. Performance measurement methodologies are now commonly available. The ultimate aim is to optimize LOP and OLOP by a judicious mixture of:

- 15.1 What we measure in terms of ability.
- 15.2 Types of measure employed.
- 15.3 Influences of performance on other attributes.
- 15.4 Evolving balanced scorecards for all attributes.
- 15.5 Identifying performance measures.
- 15.6 Keep "SMART" i.e. specific, measurable, achievable, result oriented, time bound objectives.
- 15.7 Self-assessments used as inputs.
- 15.8 Quality frameworks to assess inputs.
- 15.9 Performance reviews fine tune capabilities.

Benchmarking of seafarers is only possible if all the above, already existing broadly under the umbrella of ISM are assimilated, and built into the Certificates of Competency examinations, Crew Training and Certification.

16 Benchmarking of crew will ultimately result in a **"crew grading system"** depending upon their abilities. This grading would be generally in four categories A to D where Grade A would denote the highest level and Grade D the average level. There would be no scope for poor and below par grades. Eventually owners/flag states should have the scope to select the best, and insurance companies the moral courage to respect quality. Levels of safety would then be really enhanced.

Conclusion

With the ever increasing demands for safety at sea and environmental protection, a very important terminology needs to be added for overall success and that is SOLOB, or "**Safety of Life on Board**". SOLOB is all about crew functioning and performance, and is measured in terms of LOP and OLOP. Most aspects of SOLAS, and ships performance are a function of SOLOB, expressed in terms of LOP and OLOP. It is an independent probability by itself and is the underlying principle of HOE. Benchmarking is the key element to define SOLOB in "SMART" terms.

It can be thus seen, that if qualitative changes in our perception of safety and environmental protection are to be implemented, it is necessary to Benchmark seafarers, since quality principles and reliability of machinery, steelwork and ships systems are already products of industrial benchmarking. The whole effect today is to ensure that seafarers from different ethnic background, and varied levels of education and capabilities perform uniformly to optimal standards under the most diverse conditions. That is the only way benchmarking of seafarers would serve its ultimate purpose.

Recommendations

The Indian Administration which has vast inputs from Seafarers experience and crew management companies worldwide, strongly feels that more inputs need to be put into Section B-1/9-2 of the STCW Code in a form that not only takes into account performance standards at entry level but also sets standards at other levels of Competency during a Seafarers Career.
