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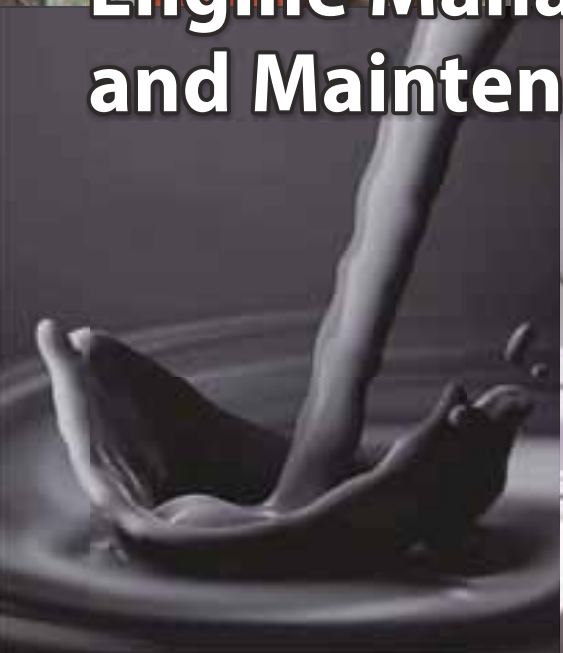
P&I Loss Prevention Bulletin

The Japan Ship Owners' Mutual Protection & Indemnity Association Loss Prevention and Ship Inspection Department

Tips for Effective Engine Management and Maintenance



Contents

Chapter 1 Introduction

In previous seminars and loss prevention bulletins, we introduced the following themes:

- the causes of marine casualties/incidents,
- the reasons why similar types of marine accidents continue, and
- the recommended measures needed to prevent a reoccurrence.

A brief outline of each is given below.

The root cause of marine casualties/incidents:

A Chain of Human Errors.

The reasons why similar types of marine casualties/incidents continue:

While it is impossible to prevent human errors completely, in the past, those involved in safety management and many shipowners/management companies have taken measures to prevent recurrence from a technical perspective because they assumed that the cause of casualties/incidents was mainly due to the chain of errors that surfaced as a result of technical issues. Previously, the parties who were directly related to the casualties/incidents were punished and the case was closed.

However, with this method, the possibility of the same kind of accident reoccurring is apparent, since we have not analyzed the root cause as to why experienced crewmembers and marine engineers generated human errors that could lead to casualties/incidents.

Recommended measures to prevent a reoccurrence:

We need to analyze the human behavior characteristics of the person who caused such errors: the root cause, the psychological factors, and human capability/ limitation, to establish an environment that eliminates them.

When focusing on the root causes of a ship's machinery failure and incidents, it appears that most cases are the result of management problems regarding oils (fuel oil and lubricating oil) and inspection/repair/maintenance work that was not properly performed. However, the engineers and their crewmembers in the engine department tend to pursue the cause as to whether there is any abnormality regarding mechanical/ electrical engineering integrity and soundness in design/manufacturing, such as whether the engine machinery/equipment itself is working and running normally or not. Regrettably, it is often the case that reoccurrence preventive measures, such as those mentioned above, tend to get neglected or forgotten.
In this guide "Tips for Effective Engine Management and Maintenance" we have included all of the key elements taken from our open seminars that were held in Japan in 2019.

Mr. Osamu Hayashi, a *yobikō* (university prep. school) lecturer, known for his famous phrase "*Ima desho!* (Do it now!)" explains that the common causes of historical failures and defeats are "**conceit, preconception, and a lack of information**". We should view them as human behavioral characteristics. Therefore, we recommend that ship owners/ ship management companies, in particular, recognize human behavioral characteristics as a threat. We wish to emphasize the importance of ① "**supporting human resources**" and ② "**being prepared for panic**". By cooperating with the vessels and those who man them more effectively will lead to successful teamwork. It is hoped that the key points raised in this bulletin will assist and promote prevention and the reoccurrence of casualties/accidents.
Please refer to the following loss prevention bulletins on human behavioral

characteristics, psychological factors, and human capability/limitation that contribute to the root causes.

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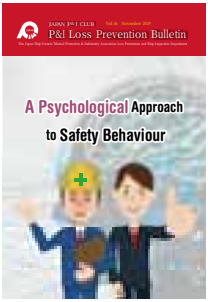
Thinking Safety – Bridge Resource Management and Engine Room Resource Management

(Issued in July 2015)



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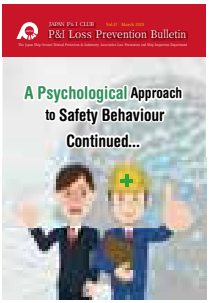
A Psychological Approach to Safety Behaviour

(Issued in September 2019)



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A Psychological Approach to Safety Behaviour Continued

(Issued in March 2020)

Chapter 2 The importance of repair/ inspection/maintenance

The following are the fundamentals of repair/inspection/maintenance and are empirically said to be the lifelines of the engine department.

- The management of Oils (fuel oil and lubricating oil)
- The grasping of machinery working status/appropriate maintenance (especially the fuel supply system)

ERM (Engine Room Resource Management) was stipulated as a requirement following the revision of the STCW Convention (International Convention on Standards of Training, Certification and Watchkeeping for Seafarers) in 2010. The requirement specifies the standards of navigational watchkeeping needed in accordance with the Mariners Act in Japan. The standard goes on to explain that crewmembers must surely implement what has been traditionally important/necessary regarding technical knowledge and maintenance methods that are the fundamentals of engine management. To reliably realize this, crew members must utilize all of the engine department's resources and cooperate with one another, communicate with the engine team effectively, and make sure that work on planned maintenance is carried out along with continuous condition monitoring while keeping up to date with training. Therefore, repair/ inspection/maintenance is closely linked to ERM.

It is also recommended that not only the crewmembers on-board, but also that the shipowner/ship management company consider the following to achieve effective engine management in addition to mechanical/electrical engineering technical theory:

It is essential to respect the “positiveness and faithfulness” of humans.

It is necessary to be mindful of “supporting human resources” paying particular attention to the fact that “people have limitations”.

2-1 Building up a trustful relationship among engine team members

Figure 2-1 is one of the posters that we issued in early 2019 to promote safety. There may be a gap between what the “boss” expects (conceit and the preconception) and what the “younger crewmember” may understand (a lack of information). The poster reminded the author of one day when he was looking around the engine room for something, about 30 years ago when he first boarded a ship. Have you ever experienced something similar to the scene in this poster?

Figure 2-1 4th Engineer gets lost and struggles

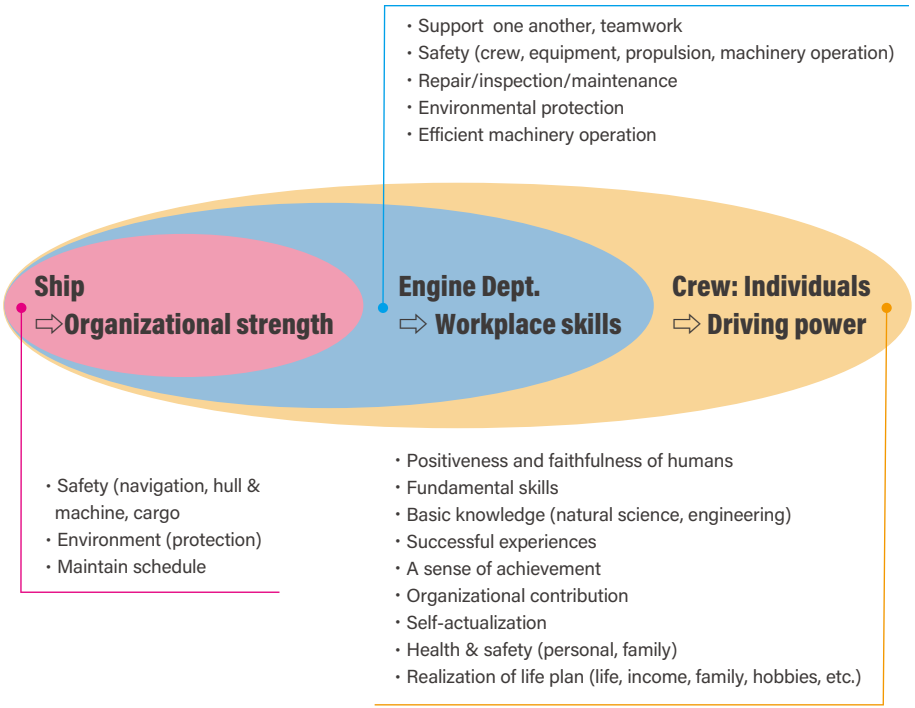
Social and economic development is now stable following a period of rapid economic growth after world

war II, the collapse of the bubble boom economy in 1991 in Japan, and the 2008 Global Financial Crisis. As a result, while our freedom to think and diversity, and ability to choose are respected, there is the concern that humans have become vulnerable to stress in social situations due to such respect and sensitivity towards individual rights.
However, life onboard a ship is still sometimes considered backward with a system that remains straitjacketed and hierarchical. If experienced crewmembers teach younger crewmembers in an old-fashioned manner with conceit and preconception, it may be too overwhelming for younger crew members. This may scar them mentally and it may take some time for them to recover. Therefore, to create a sustainable workplace, experienced crewmembers should be aware of the fact that younger crewmembers are more vulnerable to a stressful environment, particularly when under the supervision of experienced crewmembers. Given these circumstances, experienced crewmembers also need to acknowledge this and take a more flexible approach, for example:

① To compliment younger crewmembers whenever possible
② To not give ambiguous instructions to younger crewmembers
③ To create a safe space and environment where younger crewmembers can concentrate
④ In order to support younger crewmembers, experienced crewmembers need to be aware of what they need to know, and not pressure them

It is recommended that the senior engineers conduct an extensive and comprehensive diagnosis of each crewmember in the engine department as early as possible, so as to be able to approach younger crewmembers appropriately. Please refer to “Reference material 01: Ability diagnosis of onboard work performance” (Page 106).

It is difficult to build up a trustful relationship in the engine team under vague circumstances, i.e. an attitude of conceit, preconceptions, and a lack of information will hinder a trustful relationship. To prevent this, as shown in Figure 2-2, experienced crewmembers and younger crewmembers should establish a sense of unity.



Establish a sense of unity	Root causes behind individual action: Respect/trust/peace of mind (mentally)
	Control & manage attitude and emotions (envy)
	Knowledge/ability/skill related to emotional regulation: Trustworthiness, principles, ability to evaluate, ability to communicate, achievement, autonomy
	"Do not lie, do not make excuses, & do not betray colleagues: to save face

Figure 2-2 On building a better team

Therefore, the experienced crewmembers need to utilize 6 capabilities effectively to build a trustful relationship with younger crewmembers who have a diverse way of thinking, especially when they work on onboard operations that require organizational control and discipline.

The 6 capabilities are “trustworthiness, principles, ability to evaluate, ability to communicate, achievement, and autonomy”.

Trustworthiness : **Self-protection makes for a weak leader.**

Don't be dismissive.
Support those under your leadership.
Be true to your word.

Principles : **Rules that follow a vision are strong.**

Have a clear vision.
Decide how the team should be.
Breaking the rules is a joint responsibility.
Create rules to prevent mistakes and gaps.
Eliminate the contradiction between words and actions.

Ability to evaluate : **An absolute appreciation of roles is motivating.**

It is not necessary to be biased (unfairly kind).
It is important that everyone develop strong resilience.
It is necessary that everyone be aware of their role.
Investing in the education of younger personnel under your leadership is ideal.

Ability to communicate : **Was the information "understood" rather than simply "transmitted"?**

Always encourage them to leave their comfort zone and make sure that everything is absorbed.
Use repetition if you want to be understood.
Don't communicate with uncertainness.
Share the best and ultimate achievements.

Achievement : **A mechanism that allows a team to exert its greatest performance.**

Leaders must work harder than anyone else.
Keep going no matter the outcome.
Consider the result an "opportunity to learn" that will strengthen younger personnel under your charge.
Face and respect your younger personnel as individuals.
Create an updatable and readily accessible manual.

Autonomy : **Create an environment that encourages those under your charge to act of their own accord.**

Create a safe work environment.
Encourage newcomers to emulate others.
Real leaders win over both superiors and those under their charge.
Endurance is key to success.

If you try to control your those under your charge by downplaying them, you will likely be repulsed and may face difficulties in building a strong team. In other words, if you do not respect those working for you, they may never listen to you and may never cooperate.
In short, it is important that "one does not lie, does not make excuses, and does not betray their team". Namely, "do not betray others to save face".
Based on this, if the mutual understanding of values between the two parties creates cooperation and empathy, the engine department can build the most robust teamwork and obtain high-quality work results.

Shipowners and ship management companies tend to tighten the SMS (Safety Management System) as a countermeasure for casualties/accidents. However, it should not interfere with the teamwork of the crewmembers.

2-2 Why is repair / inspection / maintenance necessary ?

The author attended a seminar on the human factors surrounding aeronautical engineers, which included many hints that could be considered applicable for onboard work in a ship's engine department.

Tips that can be applied to a ship's engine department

The aviation field considered human characteristics and capabilities carefully in aircraft design to effectively improve manoeuvring operations. This is where an understanding of human factors first began. Besides, even in recent years, even though aircraft technology has advanced to a high degree, it is dependent on humans to a large extent, so it is extremely important to understand human behavior characteristics and to align them with machines to improve overall system safety. The author would like to focus on the background of a more profound recognition of human factors.
Figure 2-3 shows the "biggest threat" to aircraft and ships, two main forms of transportation.

On an aircraft, if the aircraft gets damaged or there is engine failure due to “human” error with repair/inspection/maintenance or if it is manoeuvred incorrectly, “gravity” will cause it to crash.

On a ship, if a ship sustains damage to the hull or the main engine stops because of “human” error similar to the above, a marine casualty/accident occurs because the “water (sea)” causes instability, inconvenience, and isolation.

Therefore, both forms of transportation have the same phenomena in common, that is, the biggest threat is “human beings”.

Aircraft and ships are inspected before commencement of operation to ensure that they have been designed and built in accordance with the rules and regulations and that they are operated correctly. On passing, a certificate is issued. This is then proof that an aircraft is airworthy or that a ship is seaworthy.

Figure 2-3 What is the beings threat?

The carrying out of repair/inspection/maintenance is to “maintain the inherent airworthiness and seaworthiness” of an aircraft or ship. Besides, it is just this “essential positive action” that enables “humans” to discover defects or problems within machinery. However, because “humans” work on this machinery directly, and let us remember that “humans” pose the greatest threat, it is recommended that experienced crewmembers always reconfirm just what “repair/inspection/maintenance” is and make