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## Situation Awareness and its Practical Application in Maritime Domain

*Failures of situation awareness and situational assessment overwhelmingly predominate, being a causal factor in the majority of those accidents attributed to human error. (C. C. Baker, D. B. McCafferty, American Bureau of Shipping, USA 2005)*

*USCG accident database indicates that failures of situational awareness are credited with more than 60% of all accident causes. A study on 100 accident reports from the website of the Canadian Transportation Safety Board (TSB Canada) shows that 25% of all accidents are in situational awareness group. (American Bureau of Shipping, USA 2005)*

### **Introduction**

Originally, Situation Awareness was an aviation term. The term is now widely used in shipping industry which is highly dynamic, complex and involves human factors in different areas such as bridge team operations.

Most navigational related accidents are either collisions or groundings. Some of the contributory causes to these accidents are misinterpretation of Collision regulations, deviation from approved passage plan and technical or system failures.

A review of the practical application of SA and how it is linked to Passage Planning, Collision regulations and System or equipment failures may help the navigational bridge team members to have a better understanding of the importance of SA in accident prevention.

### **Situation Awareness**

Endsley defines Situation Awareness as *“the perception of the elements in the environment within volume of time and apace, the comprehension of their meaning and the projection of their status in the near future.”*

Situation Awareness may be gained by answering four simple questions;

1. What happened?
2. Where are we?
3. What is happening?
4. What could happen?

There are three components to gaining Situation awareness; gathering data, understanding and projecting ahead. In order to maintain and improve Situation awareness one should repeatedly go through the three components.

Without any hesitation team's Situation Awareness is highly dependant on individual's situation awareness and it is under the influence of environmental, personal, organizational and informational factors. The first step in bridge team situation awareness is self awareness. Self awareness can only be achieved by self questioning and self monitoring. Questions like; do I have a plan for what I want to do? Am I using all my resources? What would I do differently next time?

To maintain high situation awareness as a team, each member should maintain high situation awareness and this is not possible unless each member questions himself about his state of awareness. Some of the questions are: what don't I know that I need to know? What do others know that I need to know? What do I know that others need to know? Each team member should actively confirm that the future situation agrees with or differs from the intended plan. In other words, does the plan need to be adjusted? Do the priorities need to be re-assessed?

### **Situation Awareness linked to Passage planning**

The 4 stages of passage planning are; Appraisal, Planning, Execution and Monitoring. An appraisal of all information must be made before planning; this is definitely the first step when gaining situation awareness. Appraisal is simply another term which can be used for gathering and understanding data. The next stage in passage planning is planning itself. This is equivalent to understanding and projecting ahead. While planning, the bridge team members must ensure that the entire vessel's navigation is planned adequately with contingency strategies in place where required. Execution and monitoring of the plan are the next two stages of a passage plan. The combination of these two is very similar to projecting ahead in situation awareness. While executing and monitoring, the team members shall maintain a close and continuous monitoring of the vessel's position. Since it is unlikely that every detail of a passage will have been anticipated, particularly in coastal waters, then it is necessary that bridge team members strive to maintain their situation awareness by repeating the same stages over and over again. Any passage plan may be revised at any point of time during the execution stage if team members' level of awareness changes.

### **Situation Awareness linked to Collision Regulations**

There are specific internationally recognized Prevention of Collision Rules that expressly or implicitly refer to the importance of situation awareness. Rule 5 (Look out) and Rule 6 (Safe Speed) are very good examples emphasising on "Prevailing Circumstances and making a full appraisal of the situation" or rule 7 (Risk of Collision) requires the OOW "not making assumptions based on scanty information" and also paying attention to

“Prevailing Circumstances” or Rule 19 (Conduct of Vessels in Restricted Visibility) which requires “Every vessel to proceed at a safe speed adapted to the prevailing circumstances and conditions”. It is really surprising that The International Regulations for Preventing Collisions at Sea 1972 known as the (COLREGs) emphasizes on Situation Awareness since 19<sup>th</sup> century and yet maritime industry has not paid attention to term itself until quite recently.

### **Situation Awareness linked to Critical Systems Failures**

Bridge officers are required to understand the concept of Critical Systems Failures (CSFs) and be very familiar with their own and their fellow bridge team members’ roles in response to CSFs. Critical Systems are those onboard systems essential for berthing, unberthing, and/or executing legs of the voyage where failure of the system in question would adversely affect the Bridge Team’s abilities to either extricate the vessel from the situation or safely complete the manoeuvre. An equipment failure which occurs during a critical stage of the voyage that has the potential to impact the safety of the vessel, passengers, crew or environment is a CSF. CSFs have been contributory causes in many accidents; therefore, the Bridge Team’s ability to identify these failures at an early stage will help ensure effective action is taken. In order to efficiently address a system failure the bridge team members should assess the situation and determine if the failure is a CSF and anticipate the effect of this failure on the vessel. The mentioned steps are exactly the three steps of gaining situation awareness. The response to CSFs must be identified, documented and regularly practiced to ensure successful management of the emergency. Procedures/checklists when combined with good SA will assist the bridge team in a full factual assessment of the current and the anticipated future situation of the vessel.

### **Conclusion**

Individual and team SA is possibly the most critical element of good ship management. Staying alert is just an overused cliché as there is no substance to it where as Situational Awareness has a defined process that can be applied to every facet of shipboard operation. The SA Loop is an easy way for mariners to ensure that they are gathering the right data, contributing and seeking critical information and are “staying ahead of the vessel” in order for them to effectively manage current and future shipboard operations.

### **References**

- John Harrald and Theresa Jefferson, 2007, Shared Situational Awareness in Emergency Management Mitigation and Response**
- Mica R. Endsley, 2000, Theoretical Underpinnings of Situation awareness: A Critical Review**