The Cruise Ship Scorecard

A Prevention Measurement Tool

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Can you manage what you can't measure?

As this age old question continues to be debated, I argue it is very difficult to effectively manage what you are unable to measure and if you don't have measurements emotion and hope end up driving strategic planning. In most cases, the product is actually only a feeling or approximation of how well things were done; however there is no accurate parameter to assess quality.

In the past U. S. Coast Guard Marine Safety (Prevention) operations have attempted to measure the quality and effectiveness of their mission performance by assessing ship marine casualties or incidents. In other words, if a ship hasn't had an "incident" that is a sign of a working and effective Prevention program. These, however, are tombstone events which do not measure the value of a Coast Guard examination because they are not necessarily linked to what examiners verify or find during ship exams. We encounter yet again the same age old question. How do we know our Prevention mission makes a difference? How do we measure its effectiveness in order to adequately manage the mission? If we flipped a switch and stopped all of our Prevention work, would we see an immediate consequence or would maritime operations continue without incident? The key is to understand and measure how well the human examiner performs. How well do they conduct that examination? Prevention work, I argue, is like geology and pressure makes diamonds.

The Response vs. Prevention Comparisons

Fire covering several decks on cruise ship, STAR PRINCESS

Think about the following scenario happening on a cruise ship. An electrical fire occurs and the firefighters race to the heroic rescue. The response time is measured, the lives saved are measured, and the response is considered of great value to everyone who reviews what just occurred. Now if we rewind the scenario, consider a trained examiner inspecting a newly installed electrical system, identified a potential risk of fire due to improperly installed wiring, and wrote an order to have the wiring changed before the system was energized. How can this inspector be recognized as a hero? How is the value of the observation of an unsafe condition and order to fix it, actions which ultimately prevented the fire, actually determined? The reality is that the response is easy to measure and prevention is difficult to measure. Everywhere around us we see metrics and measurements. Business has measurements, sports have measurements, academics and, of course, U.S. Coast Guard Response operations have measurements,

yet measurements in Prevention operations do not exist. This is due to the inherent difficulty in getting those Prevention metrics to be accurate.

What Drives Human Performance

Looking at human performance from a business standpoint, we know that nothing is more costly to an organization than poor human performance. Simply going through the checklist of a Prevention inspection or examination does not account for the measurable value of the work put forth by our teams. For our cruise ship exam teams, we have a good handle on their capability. Our teams are comprised of well trained, experienced and qualified port state control officers. For the performance aspect, we have our Foreign Passenger Vessel Examiners course, Performance and Qualification Standard (PQS), Tactics, Techniques and Procedures (TTP), and Process Guides to drive and support examiners. Examiners possess strong skills and knowledge. The environment is fixed and we do not have any control over the circumstances of the ship on the day of the exam. A key factor, which we do have control over, is the one factor we do not have a good handle on. That is motivation. Motivation is the aspect of the Human Performance Equation that we can affect. Through a measurable performance metric, we can identify a quantifiable outcome and really gauge and analyze our efforts in the prevention of marine incidents aboard ships. In an active environment, knowledge alone is the dissemination of uncertainty and measurable performance of the team is where we can identify a quantifiable outcome and really measure our efforts in the prevention of marine incidents aboard ships. In other words telling someone how to do something does not constitute training. Knowledge of SOLAS regulations alone does not mean you are competent at the coordination, communications, and decision making required during an active cruise ship examination.

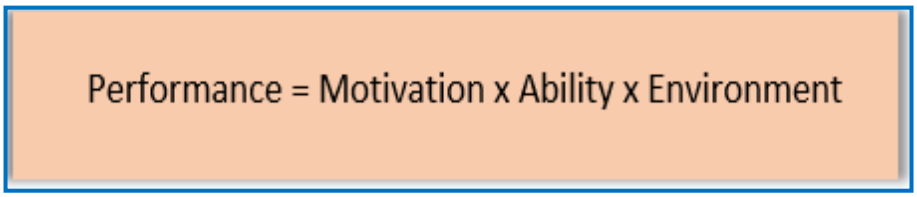


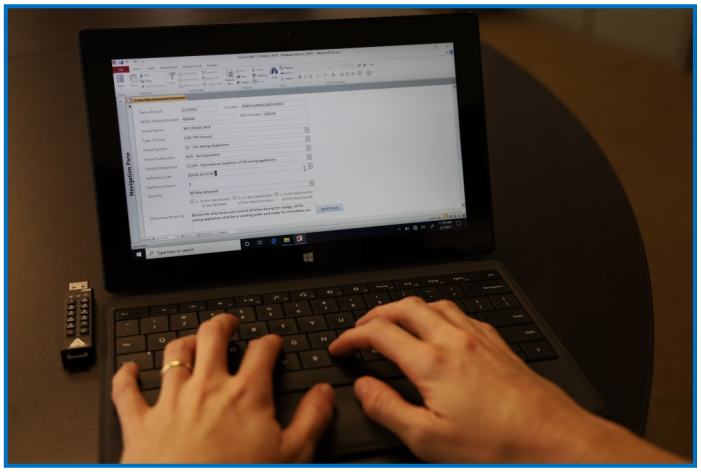
Figure 1. Human Performance Equation

When considering the performance equation, at best, if all factors remain stable, performance will also remain stable. The ability to conduct examinations is achieved through training, qualification and allocating needed resources for Coast Guard examiners. The environment, the conditions onboard the vessel, are fixed. The factor which we can change is motivation and that is our focus.

How Do We Motivate?

We have to measure our teams' performance. Scores are used both to measure and motivate. Scores incentivize and increase the quality of human performance. Think about credit scores, Uber ratings, football scores and statistics. We can improve performance by measuring it with a numeric metric. Translating that into cruise ship inspections, by grading examiners we motivate them to seek higher scores which will improve performance. Performance aboard the ship will also improve as the crew will seek to keep the scores low.

The Scorecard



LT Kimberly Glore using the Scorecard

The cruise ship Scorecard has been in development for over ten years as a long-term goal of the Cruise Ship National Center of Expertise (CSNCOE). We recognized how well the CDC's Vessel Sanitation Program (VSP) scoring system incentivized positive performance from the ships crews. The score brought awareness to the public and, more importantly, it gave the ships' crews an identifiable result of how well they were doing onboard the ship to maintain compliance. This score has been incorporated as a Key Performance Indicator (KPI) within the major cruise lines' corporate measurements.

While creation of a U.S. Coast Guard cruise ship Scorecard might have seemed straightforward, in reality it first required the establishment of a quality examination program and a process to be consistently implemented and audited. Given that Marine Safety operations use a quality management process, the Mission Management System (MMS), we should have a metric assigned to measure the quality of the work we perform. Just having a quality management system does not mean you have a quality process within your organization; business rules have to be established. Imagine you enjoy a particular cup of coffee from a large brand: you expect to have the same experience when you order a coffee in London that you did in Seattle and expect the same in Hong Kong or Paris. Good organizations have processes and values that influence individual behavior and we needed to improve our organizational processes to bolster the quality and consistency of Marine Safety examinations. This led to the development of a long-term quality improvement process that incorporated six implementation steps.

The first step was a comprehensive and systematic review of the Foreign Passenger Vessel Examination process. We found the exam process to be the largest impediment to the examination teams' performance on the ships. Although we had very competent examiners, who

knew the regulations, the process to conduct the examinations was inconsistent and not well executed throughout the Coast Guard. In order to remedy that, we developed the Holistic Examination Process and modified how the examiners were viewing the ships and approaching the examinations. In the beginning, this Holistic Examination Process was housed in an (MMS) work instruction, which outlined the workflow process to be followed to conduct this quality examination process. Placement of this workflow in an MMS document proved difficult because MMS was not policy. In order to have all Sector Prevention and Marine Safety offices implement this exam process, we needed it to be included within policy. We then learned about Tactics, Techniques and Procedures (TTPs) and developed the first Prevention TTP. This was the Foreign Passenger Vessel Examination TTP. TTPs provided the best platform for the Holistic Exam Process to reside and allowed for the opportunity to incorporate changes or updates.

The second step was to train examiners, which required a complete change to our training programs in order to more effectively support and teach the holistic examination process. We needed to teach the new expectations with the holistic approach to examinations and show trainees what "good performance" looked like during an exam. The Foreign Passenger Vessel Examiners course was overhauled to deliver these objectives. Many basic and redundant Port State Control sections of the course were reduced while human performance and exam process actions were emphasized to promote increased consistency and better human performance from our examination teams. Again, process and human performance are the critical keys to success. You might know every play a football team can set, however, if I gave you a ball could you yourself perform those at the expected level? In addition to technical knowledge, we must have teams who can perform. Performance means much more than knowledge of rules and regulations. They have to adequately communicate with the ship officers, conduct an examination in an efficient manner and properly document the deficiencies to reduce rebuttals or questions from ship, class and flag representatives.

The third step was to develop job aides as performance support tools to aid the process flow aboard the ship while the examinations were being conducted. The old 840 books were discontinued and new performance job aides were designed and implemented. Real mission support and associated tools should facilitate the performance expectations. Checklists themselves do not help examiners perform to a higher level. They merely allow you to move on through the process more effectively. We need to facilitate better comprehensive human performance both from the individual and the team.

The next step was to create a way to verify the quality of the examination process in order to continually improve upon this process. Our voluntary audit program became a non-intrusive option for commands to have us observe their teams in the field and measure their performance against the standards outlined within the TTP. The word "audit" should not be a scary term. The key is to have an avenue for feedback to help make improvements, enhance examiner proficiency, and increase effectiveness of examinations. All too often, assessments and performance reviews simply kick the mediocrity of the enterprise down the road. We must have honest and critical reviews of how we are performing. The individuals and teams must always be under review to support the entire enterprise to be better. Continuous performance improvement is how we ensure success.

The fifth step was to provide the right data entry tools to help and support the expected performance. The CSNCOE analyzed the Marine Information for Safety and Law Enforcement (MISLE) database and found some alarming non-conformities which showed great disparities in deficiency documentation, how these were linked to regulation and how they were recorded into the database. We discovered over 3000 different potential permutations of inputting cruise ship deficiencies within MISLE. This number was alarming and presented a significant problem with consistency and the quality of the data going into MISLE. By searching through all the potential cruise chip deficiency entries, we were able to pare down the list to only 345 possible deficiencies. With this data we built the MISLE user guide. Although we could not fix MISLE, we could certainly help to improve the quality of the data entered. The MISLE user guide proved to be very effective in improving the quality of the deficiencies being entered into MISLE. Increasing the quality of examination data entered into the database in turn increased the accuracy of the review and analysis.

With the development of the MISLE user guide and the new Performance Job Aids, we were able to move on to the sixth step in building the Scorecard. For a few years, we searched for the best way to develop a numerical scoring value to measure prevention. We studied work done by homeland security in preventing terror attacks, business balanced scorecards, risk reduction values, and various prevention measuring studies, such as Strategies to Improve Marine Inspection Performance in the Coast Guard, by LCDR Josh Buck, which were carried out yet never materialized into products employed in the Coast Guard's Prevention Program. The problem continued to be: How do you measure prevention accurately? How do you prove a negative? We realized we should be measuring OUR performance instead of what happens to a ship when under the control of its crew. We should recognize that when a quality process is implemented, the examinations themselves reveal the results of that process. And yes, we can measure this. From our research, we developed a weighted value system for deficiencies found during our examinations. We knew, however, that our process and values had to be evidence-based and defensible. Creation of a good system alone would not translate into widespread acceptance.

In late 2016, our Scorecard project was selected for the Research and Development Test and Evaluation Program by the U.S. Coast Guard Research and Development Center's (RDC). Development began in October of 2018 and the final product, and report, from the RDC was completed in March of 2020. The RDC took our idea and developed the risk-based methodology using our desire to define a quantitative risk metric found during cruise ship examinations. During the build we included subject matter experts from units with a high number cruise ship exams, and informed the other innovative U.S. Coast Guard initiatives, Marine Inspector Performance Support Architecture (MIPSA) and the Inspection Application (INSPECT APP) teams to prevent stove piping and help to build a robust tool able to be incorporated into a final inspection application product hosted in a cloud environment. Our ground rules included that the process must: save examination time, be a true mission support tool, be able to work with existing Coast Guard IT infrastructure, and provide quality data output.

The U. S. Coast Guard Cruise Ship Scorecard is now completed and being deployed to the field. The Scorecard measures team performance and provides a human performance incentive with better deficiency data that can be understood and analyzed. With the Scorecard, identified deficiencies

are entered into a database that determines the risk profile associated with each deficiency. Analysis of deficiencies measure the total risk reduction, or the potential negative consequences, which have been mitigated with the examination. The Scorecard application auto-fills the deficiency cites into the required Port State Control forms, CG-5437A (Form A) and CG-5437B (Form B), thereby increasing efficiency and eliminating the use of hand-written forms. As a performance support tool, it saves examination team time aboard the ship, and in the office, while providing easy to read exam forms.

What does the SCORE mean?

The score is a risk-based methodology within which a deficiency is given a weighted score value based on the risk consequence of that condition aboard the cruise ship. It is a measurement of how much risk was identified, and thus mitigated, aboard the ship by the examination team. This risk-based methodology behind the Scorecard was developed at the U. S. Coast Guard Research and Development Center. The RDC, subject matter experts (SMEs) from the field, and the CSNCOE examined, categorized, and quantified all common cruise ship deficiencies together via this risk-based methodology.

Note: There are 14 total categories. Categories 6 & 12 are unrelated to cruise ships.

Category	Weight	Rank	Sums	Personal Mishap	Grounding	Flooding/Sinking	Fire/Explosion	Collision	Loss of Power	Environmental	Security Incident
01 - Certificates & Documentation	0.142857143	1	9	1	1	1	1	1	1	1	2
02 - Structural Conditions	1.714285714	12	14	3	3	2	1	2	1	1	1
03 - Water/Weathertight Conditions	0.857142857	6	10	2	1	2	1	1	1	1	1
04 - Emergency Systems	1.428571429	10	13	3	1	2	2	1	2	1	1
05 - Radio Communications	0.714285714	5	10	1	1	1	1	2	1	1	2
07 - Fire Safety	1.571428571	11	13	3	1	1	3	1	2	1	1
08 - Alarms	1.142857143	8	12	2	1	2	2	1	2	1	1
09 - Working and Living Conditions	0.428571429	3	10	2	1	1	2	1	1	1	1
10 - Safety of Navigation	1.285714286	9	12	1	2	2	1	3	1	1	1
11 - Life Saving Appliances	1	7	10	3	1	1	1	1	1	1	1
13 - Propulsion and Auxiliary Machinery	2	14	18	2	3	2	3	3	3	1	1
14 - Pollution Prevention	0.571428571	4	10	1	1	1	1	1	1	3	1
15 - Safety Management Systems (ISM)	1.857142857	13	17	3	2	1	2	2	2	3	2
16 - International Ship & Port Facility Security (ISPS)	0.285714286	2	10	1	1	1	1	1	1	1	3

Table 1. Summary of Categories and Weight Scores

Table 1 shows all deficiency categories (Certificates & Documentation, Structural Conditions, International Ship & Port Facility Security (ISPS), etc.) assessed with different hazards and risks. The deficiencies are analyzed using a low, medium, or high risk level structure which is labeled 1, 2, or 3 respectively and color-coded appropriately. For example, if a cruise ship showed a deficiency in the Certificates & Documentation category, we determined there would

be a low risk level of the following incidents or hazards from occurring: Personal Mishap, Grounding, Flooding/Sinking, etc). As shown on the table, all the hazards across the Certificates and Documentation category are captured as low risk except for the risk of a Security Incident, which is captured at a medium risk level. After completing this analysis for all 14 categories, they were ranked in order of their risk levels, with 1 signifying the least risk, up to 14 which signified the most risk. The research team assigned a spread of weighted values (between 0 and 2) appropriate for these given categories. Each category's rank was divided by 7 to achieve the desired spread of these weights between 0 and 2. For example, category 01, Certificates and Documentation, and category 16, International Ship and Port Facility Security (ISPS), have weights of 0.14 (1 ÷ 7) and 0.29 (2 ÷ 7) respectively. As a result, Table 1 shows lower risk level categories have lower weights, e.g., Certificates and Documentation, and International Ship & Port Facility Security (ISPS) having weights of 0.14 and 0.29 respectively. Similarly, higher risk level categories have higher weights, e.g, Propulsion and Auxiliary Machinery, and Safety Management System (ISM) having weights of 2.00 and 1.86 respectively.

wScore	Score	ID	Vessel System	Vessel SubSystem	Vessel Component-Deficiency	Regulatory Cite(s)
0.142857	1	45	01 - Certificates & Documentation	013 - Documents	01323 - Fire safety operational booklet	SOLAS 14 II-2/16.2
0.142857	1	46	01 - Certificates & Documentation	013 - Documents	01324 - Material Safety Data Sheets(MSDS)	SOLAS 14 VI/5-1
0.714286	5	47	01 - Certificates & Documentation	013 - Documents	01326 - Stability Information Booklet	SOLAS 14 II-1/5-1
0.714286	5	48	01 - Certificates & Documentation	013 - Documents	01332 - AIS test report	SOLAS 14 V/18.9
0.428571	3	49	01 - Certificates & Documentation	013 - Documents	01333 - Ship specific plans for the recovery c	SOLAS 14 III/17-1
0.714286	5	50	01 - Certificates & Documentation	013 - Documents	01335 - Polar Water Operational Manual	SOLAS 14 14 XIV/2.3.1
0.714286	5	51	01 - Certificates & Documentation	013 - Documents	01337 - Certificate or documentary evidence	33 U.S. Code 2716
8.571429	5	52	02 - Structural Conditions	N/A - No Subsystem	02101 - Closing devices/watertight doors	SOLAS 14 II-1/13
3.428571	2	53	02 - Structural Conditions	N/A - No Subsystem	02102 - Damage control plan	SOLAS 14 II-1/19
1.714286	1	54	02 - Structural Conditions	N/A - No Subsystem	02103 - Stability/strength/loading informati	SOLAS 14 II-1/Part B-1
8.571429	5	55	02 - Structural Conditions	N/A - No Subsystem	02105 - Steering gear	SOLAS 14 II-1/29

Table 2. Risk-based scoring of cruise ship deficiencies

Table 2 shows a preview of the scoring system conducted by the research team. Using a scale of 1 to 5, with 1 being the least risk and 5 being the most risk, each deficiency was scored in a relative to each other within each category. For example, deficiency identifications 45 through 51 (shown in the ID column in Table 2) were risk-based scored relative to each other because they are all in the same category of Certificates & Documentation. It is important to note that, a deficiency score of "1" in a category will have a different final weighted score (under the wScore column in Table 2) than a "1" in another. This is due to the calculated risk weights given for each category. For example, deficiency ID 45 (within the Certificates & Documentation category) and deficiency ID 54 (within the Structural Conditions category) were both given the same deficiency score of 1 within their respective categories; however, their final weighted scores (wScore) differ (.14 and 1.71 respectively as shown under the wScore column). (1)

It is important to understand the significance of the weighted score. The SMEs analyzed all 345 deficiencies in this manner and, as a result, each deficiency obtained a final wScore that was risk-based. These weighted scores or wScores are the values entered into the "Cruise Ship Examination Scorecard". The score is a measurement of what condition was found by the U.S. Coast

Guard examination team during the exam aboard the ship. The higher the number the greater amount of non-compliance found, and the higher the potential risk to the ship. The lower the number the higher degree of regulatory compliance found during the exam. This score, therefore, is a measure of the performance of the examination team as they discover these deficiencies aboard the ship and provide a leading indicator of what is currently not in compliance. (1)

Although the score is an internal U.S. Coast Guard metric of our teams, we expect the ships to respond by working harder to remain in compliance which will lower their score. Given that one cannot create or fake deficiencies which are not there, the resulting consequence is expected to be ships increasing their compliance with regulations which, in turn, makes the ships safer. This score is that elusive measurement of the team's performance which also serves as motivation to improve that performance. This is the way to measure the effectiveness of Prevention operations, which will enable us to effectively manage our Prevention Program.

What's next?

As the Scorecard is deployed for use, each unit conducting cruise ship exams will receive a Surface Pro tablet from the Cruise Ship National Center of Expertise. The tablets will be pre-loaded with the Scorecard application and associated hardware and software to include associated Work Instructions and Procedures. Additionally, an approved secure thumb drive will be included to transfer the completed Form A and B to the ship for printing and then uploading into MISLE from the examiner's U. S. Coast Guard workstation. A video of the Scorecard in use is also available on the Cruise Ship National Center of Expertise Web Portal Page. The Cruise Ship NCOE will provide life cycle maintenance, upgrades, and field support for the Scorecard. We will review cruise ship examination activities, provide feedback, and validate scores. The scores primary function is to measure U.S. Coast Guard examination Team performance. We intend to use the data to determine trends, inform the FPVE training program, and enhance overall ship safety while increasing examination performance and quality.

Questions and/or comments regarding this article may be directed to:

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