HIGH PERFORMANCE TEAMS

FOR INCIDENT RESPONSE AND PREVENTION

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INTRODUCTION

The concept of high performance teams is an alluring one. After all, who wouldn't want to be a member of a team that's "high performance"? Or to look at it another way, who would want to be part of a team that is a "not so high performance team", or even a "poor performance team"? While the natural craving to make a team "high performance" is understandable, in practice, efforts to achieve this noteworthy goal are often confused with other objectives and sought without first fulfilling vital prerequisites.

What then is a high performance team ("HPT")? There is no absolute threshold that defines whether a team is high performance or not – instead, it is a relative classification. The classification is typically associated with a team that consistently performs its core duties with excellence, is highly effective at achieving its objectives, and meets or exceeds objectives that are extraordinary relative to its past performance and/or peer teams. Note that a team that demonstrates great teamwork and is staffed with highly dedicated, qualified members is not necessarily a HPT.

Since team performance is aptly classified in terms of a graduated scale rather than a 2-state system (high and not-high), we prefer to utilize a 5-level scale for classifying team performance as shown in Figure 1. Level 5 corresponds to high performance while Level 1 denotes a dysfunctional team.

Why are high performance teams relevant to accident prevention and emergency response in the oil and gas (O&G) industry? Simply stated, the stakes are exceptionally high and the performance of teams can have a profound impact on the outcome accidents and incidents. We only need to look at incidents of recent years to gain a stark reminder of this fact. What's more, various reports underscore the importance of human performance in preventing accidents in the offshore oil & gas industry [1]. Interestingly, the relationship between human performance and the occurrence of accidents persists despite widespread use of advanced technological solutions like blow out preventers [2], tank overfill prevention systems [3] and oil spill recovery and containment technologies [4]. It is for this reason that the high performance team model offers a timely opportunity to address much needed improvements in safety, accident prevention, and emergency response in the Oil & Gas industry.

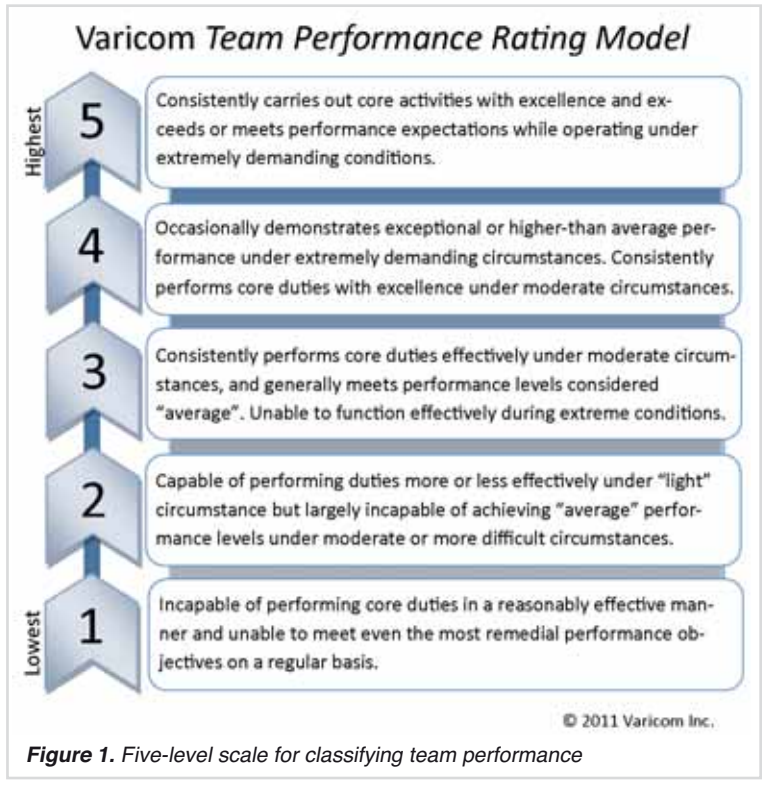

Figure 1. *Five-level scale for classifying team performance*

When a manager or team leader decrees that his or her team needs to become a high performance team (HPT), what do they really mean? In our experience, the true meaning behind such chants is often something less grand but nonetheless worthwhile, for instance, "our teamwork needs to be improved", "we need to respond faster", "communications between each of us has to occur more quickly and without confusion" and so on. No matter what is meant, merely stating the intention rarely gains any real progress in the intended direction. Much more is needed, as we will discuss below.

Putting the HPT imperative aside for a moment, it's important to clarify viewpoints and boundaries of scope regarding this paper:

- Not all teams should necessarily be expected to strive for "high performance". It is an internal decision and will vary on a case-by-case basis. In our view, the importance of "average" performing teams should not be diminished as they may indeed play a meaningful role in their organization's overall mission.
- While we present our approach that is based on what has worked for us, we have no illusions in thinking that our collection of techniques and prerequisites is necessarily exhaustive or universally applicable. There is no "one size fits all" formula for building a high performance team and no approach that we know of that can reasonably guarantee success – ours included.
- The term High Performance Team is often misconstrued to mean "Higher performance than we now have". This paper addresses the meaning as defined above, while many of the techniques covered herein have merit as standalone measures to generally improve the performance of teams.
- It is important to note that although overall team performance is what determines the HPT classification,

our work and the subject of this paper is primarily directed to human performance and factors that contribute to or otherwise influence human performance. Mechanized and automated systems are therefore not within scope.

In the next section, we cover what in our experience comprises the baseline conditions for a team to have a chance of becoming "high performance". Having these pieces in place are essential but they do not necessarily lead to a high performance team. More work will typically be needed which is what the third section addresses. We'll cover techniques that we've found effective at pushing the envelope of team performance especially in the demanding world of emergency response for oil & gas.

A FOUNDATION FOR HIGH PERFORMANCE

To be clear on what type of organizational unit we shall focus on, let's briefly define what we call a "team". Simply stated, we define a team as a group of people working collaboratively and interdependently to achieve a common goal. An industrial fire brigade is one such example – a team leader directs a small group of firefighters to extinguish a fire; the person working the nozzle must be backed up by fellow brigade members to handle the line, operate the pumps and so on; no one member can perform his duties without direct reliance on other members.

In contrast, a group of workers that is driven by a common goal yet achieves the goal by having its members perform their duties for the most part independently of each other is not a team in our definition. We will call this organized unit of workers a workgroup. An example of a workgroup would be the representatives from various departments of an oil production facility who gather to review and sign-off on (or reject) daily maintenance work activities; Representatives from safety, maintenance, security, production and perhaps others would meet to review and evaluate the plans from the perspective of their domain and each give their conclusion/decision independently of the others. By definition, workgroups are not HPTs.

In order to be an operative team, the organized group we call a team must have:

- Adequate resources,
- The right mix of skills,
- Supporting infrastructure such as external groups and other teams,
- A framework for carrying out their work (collectively this entails policies, procedures, management systems, regulations, etc.)
- A means by which performance (and ultimately, success) can be measured,
- Leadership and accountability, and,
- All members must hold a clear understanding of the team's goal.

Absence or inadequacy of any of the above can derail undertakings to become an HPT.

Defining the team's goal can easily be neglected and dismissed as not all that important to the team's success. To the contrary, in our experience we find that crafting a meaningful and precise goal statement can be a vital step in the team's overall success. For instance, the goal statement can help to guide the team in prioritizing and directing its activities, track progress, and know when the team has achieved its final objective. Good examples are: "Reduce total annual reported injuries by 15%" within 3 months from project start, "Implement a company-wide emergency management system by the end of the third quarter", and "Design and implement a process for disseminating lessons from safety mishaps to all installations by May 15th 2011". Precision and concreteness are generally advisable over vagueness and concepts. Not so well stated goals would be: "Create a Safety-centric culture", "Increase teamwork within the fire brigades" and "Improve collaboration between Safety and Production".

Team members' interpretation of the team goal and how it fits in to the bigger scheme of things, while rather difficult to quantify, is just as important as defining an effective goal statement. Merely making sure that all team members can recite their team's goal probably will not be enough. Each team member should not only understand the importance of their mission but also fully embrace it. Choice of team members and leadership can play a vital role in this regard.

Setting team goals is intrinsically tied to defining measures of team performance. In the earliest stages of a team's existence, or following a new or revised directive, the team may find itself defining performance mea-

sures and targets (collectively we'll refer to these as "metrics") that relate to the goal at hand. Precision and specificity should be sought to the extent practical when defining measures of performance and targets. And when the primary objectives are at odds with other objectives or constraints (e.g., budget, time away from work, etc.), additional measures and targets may be needed to frame a balanced view of the team's performance and desired results. In the context of a safety compliance team, examples of team metrics are:

- Implement a training and compliance program that achieves compliant use of PPE in 95% of audited cases within 6 months
- For helideck mishaps during disembarkation, document, review and determine procedural revisions within ten days of initial occurrence
- Increase the frequency of emergency response drill evaluations to six per month by July 1, 2011.

While goal setting and performance measures are important preliminaries for virtually any team, their application can differ depending on whether the team's work is proactive or reactive. In the above safety compliance team example, the work is largely proactive and lends itself to advanced planning and performance target setting. Performance measures can be defined and precise targets set in advance of the team performing its work as in the above examples.

In the case of reactive work, a team's performance measures may not be so easily defined especially when the events triggering the reactive work are difficult or impossible to predict. Examples of such teams would be the emergency response units - fire brigade, confined space and high angle rescue, oil spill response, and so on. When these teams respond to a live incident, are they explicitly striving to hit a specific response time target, or other quantifiable metric? Most likely not. Instead, what's driving their work is predominantly the team's goal, subject to the conditions and situation at hand. Take for example the extrication of a pilot from his helicopter that has somehow ended up teetering on the edge of an offshore installation's helipad, uncontrollable and on the brink of falling into the sea. The relevant metric would in part be something like "remove the pilot before the aircraft goes overboard". The implicit time limit in this metric is largely dictated by the circumstances of the incident. What's more, the time limit may be unpredictable and perhaps only partially controllable or influenced by the first responders.

In the helipad example, the performance target would be formulated qualitatively and likely comprise multiple pieces – "safely extricate the pilot before the aircraft slides overboard", being the foremost, and ac-

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The Society for Underwater Technology (SUT) is a multi-disciplinary learned society that brings together organisations and individuals with a common interest in underwater technology, ocean science and offshore engineering.

SUT was founded in 1966 and has members from more than 40 countries, including engineers, scientists, other professionals and students working in these areas.

The SUT was founded to promote the further understanding of the underwater environment and to encourage: Cross-fertilisation and dissemination of ideas, experience and information between workers in academic research, applied research and technology, industry and government, development of techniques and tools to explore, study and exploit the oceans, proper economic and sociological usage of resources in and beneath the oceans, and further education of scientists and technologists to maintain high standards in marine science and technology.

companied by the following and perhaps others:

- To the extent practical, prevent the aircraft from falling overboard
- Avoid or otherwise minimize loss/impairment to the installation, its equipment and surrounding vessels
- Avoid or otherwise mitigate the discharge of hazardous materials or other events having potentially adverse environmental impact.

The metrics are stated in qualitative terms, without a quantified time target, appropriately so.

As this example illustrates, limitations abound in one's ability to craft meaningful performance metrics for reactive, hard-to-predict teamwork demands. Is there then a place for quantitative metrics in the development of high performance emergency response teams? We believe there is especially with respect to responsiveness, procedural compliance, decisive leadership and sound decision making.

This brings us to our last foundational requirement for team performance – commitment. Unlike most other HPT foundational ingredients, leadership cannot readily instill commitment nor can it easily be measured. While there certainly are factors that can bolster commitment (motivational leadership, a noble team purpose, and so on) much of it has to come from within. Careful team member selection, preservation of morale and clarity of purpose over the duration of the team's life cycle is therefore crucial.

We view commitment of team members as manifesting itself in several fronts, the first and most common of which is level of time and effort allotted by the team member for performing his or her directly assigned tasks. For instance, how many late nights and days of travel away from home is the member willing to ante up, voluntarily or when asked? But commitment to the team goes far beyond this remedial level. Rather, it extends outward to the mutual support and "looking out for" of other team members, and continually striving to preserve the overall integrity and success of the team. Extent of commitment is further measured (and tested) when extreme conditions or extraordinary demands are placed on the team. Emergency response teams may encounter this test quite frequently – climbing inside a teetering helicopter to rescue a pilot is but one example.

It is this extended level of commitment that we have found to be a vital prerequisite to a team achieving high performance. Having the support of fellow team members and the confidence that they can be counted on to provide support can be a powerful boost to dedication and tenacity when the going gets tough. In addition to bolstering trust and confidence within the team, this "super commitment" can enable the team to achieve something beyond what a well-managed group of individual performers otherwise might. In effect, it lays the groundwork for the team becoming operationally greater than the sum of its operative parts.

ACHIEVING HIGH PERFORMANCE

Achieving the noteworthy status of high performance does not automatically follow satisfaction of the above conditions. In fact, becoming an HPT can be an arduous process with incremental pieces of progress that may eventually add up to the desired result. The process for making such progress is centered on developing core capabilities that are necessary to be "high performing". These key capabilities may in a large part be a function of the operating environment and goals of the team. The Health Safety and Environment (HSE) team charged with revamping the company's safety incident reporting system would surely require core capabilities that differ from those of a spill response unit.

The remainder of this paper will focus on developing high performance capabilities of emergency response teams, an area of the offshore oil & gas industry which we believe is ready to be well served by the HPT.

We consider key capabilities of the emergency response team to include communications, leadership, teamwork, decision making, the ability to withstand loss of team members, situational awareness, preparedness and training, and institutionalization of learning and improvements. While we base our approach on our own work, many of the techniques we present have been addressed in the context of Crew Resource Management (CRM). For example, Okray & Lubnau [5] provide a thorough review of CRM for fire services, and McAllister [6] addresses CRM for aircraft crews.

Capability 1: Effective Communications Under Stress

In many of our drills and emergency response exercises one of the items most often highlighted as an area of improvement is “communications”. The communication deficiencies typically arise during the chaos of a live incident or demanding exercise. As common as this issue is, in our experience it can easily persist if not handled properly.

Indeed it is the responsibility of all team members to ensure that they are communicating effectively. As a sender, we need to (1) deliver a good message, and (2) make sure the other person understands the message. As a receiver, we need to (1) make sure we receive and fully understand the message, and (2) act appropriately based on the received message (e.g., dispatch resources, trigger an alarm, etc.).

In order for a communication (“message”) to be effective, it must be well formed. In particular, the message must adhere to the following five criteria for constructing quality messages:

- Accuracy - the message must be correct
- Precision – sufficient detail must be in included
- Completeness – all pertinent information must be included
- Timeliness – the message must be conveyed promptly and when expected
- Brevity – the message must be concise without compromising the other criteria

Various techniques can be used to help emergency response teams follow the above rules. Several that we advocate are as follows.

Order Model: During crucial communications, an “order model” should be followed whereby both the sender and receiver know that the order or communication has been fully understood. The sender transmits the message, the receiver repeats the message back to the sender, and the sender acknowledges that the correct message was repeated. If there is a problem with the receiver’s correct receipt of the message, the sender can correct or re-state for clarity.

Cadence and Clarity Control: Radio or telephone communications must be performed in a slow, clear, and concise manner. This is largely an effort in self-control and discipline. Practicing the techniques to ensure these proper techniques should be done prior to the critical or emergency communications effort.

Updating: During emergency conditions, leadership may become distracted and overburdened to an extent that they may inadvertently overlook or be inclined to neglect updates and status reports. Such tendencies should be avoided as the importance of updates is by no means diminished by incident chaos. Regular updates must be given to superiors and subordinates and these updated should be acted upon appropriately. As with other communications, updates should conform to the above criteria for quality messages.

Raising Issues: A member of the team who realizes that a certain step of an operation has not been communicated, should question the leader to see if in fact the step has taken place as expected, and if not, is this omission appropriate. Similarly, if a team member does not understand a request or order, or has a question regarding a procedure or action, then an inquiry step is necessary to clear up the misunderstanding. Ask the question!

Common Terminology: A vital attribute of the communications process is standardized language. Common terminology and simplified language allows for easier understanding of messages, especially during emergency situations.

Advocacy: If a team member has reservations or disagrees with a decision, it is his duty to respectively communicate his position provided that by doing so he does not cause adverse consequences for the emergency response. In more traditional environments, the team leader, pilot, ship’s master, OIM or other person in a leadership position was unconditionally obeyed. In an advocacy model, it is not who is right, but what is right; however, strict controls need to be put in place so that response to the incident is not jeopardized. During advocacy, one must be respectful, state opinion or recommendations about the team’s chosen course of action, suggest solutions, recommend alternative actions, and get an answer to questions [5].

Monitoring is yet another valuable technique in the communications system. This is the process of keeping track of the effects of your actions. It is a form of feedback. If we decide on a course of action, and the course of action is not changing the outcome of the situation, then we must rethink our course of action. Open, timely communication is a key to making this happen.

For longer duration incidents that

span shift changes and/or rehabilitation of participants, briefings before a shift change or critical process activity are important steps. Such briefings should be conducted to allow all staff personnel on duty the opportunity to be fully informed about the conditions present. Debriefing after a shift or after a critical event during a shift passes on information that allows others to store the situation and the solution on their active memory. The communication should conform to the above "5 criteria", and include all pertinent information, including what went right, what went wrong, and what areas need further work or improvement.

Capability 2: Leadership and Teamwork

When it comes to leadership, the appropriate style and approach are ultimately determined by the nature of the team's work and objectives. Clearly, for emergency response and emergency management teams the *de facto* standard is a centralized command and control leadership model that is implemented in a hierarchical organizational structure. In contrast, a safety process improvement team would likely be better lead with a non-hierarchical collaborative leadership model that fosters creative thinking more so than swift execution of tasks.

Each member of an organization or individual team must realize that they are all in essence part of the leadership that is important to effective decision-making and contributing to safety culture. Team members must support their leaders, but in return, our leaders must be technically competent, honest, transparent, experience, possess the knowledged for their position, fair, mission and vision minded, good communicators, and organized.

Teamwork requires members to cooperate in order to accomplish common goals. The leader identifies the goals, and the followers perform the tasks to accomplish the goals. The breakdown of teamwork can result in two ends: inefficient goal attainment and injuries [7]. In addition to effective leadership, goal attainment and teamwork require people who can both think and follow direction. As noted above under communications, there are cases in which it may be appropriate for subordinates to challenge a leader's decisions. However, in general, the authority of the leader in an emergency situation is preserved and protected unless he or she becomes incapacitated.

In certain cases a leadership model that places more emphasis on critical thinking, challenging leadership's wisdom, and even "out of box" thinking may be appropriate. Case in point, when the emergency response team is exploring ways to improve its preparedness and ultimately its performance during emergencies. "Out of box" thinking and challenges to conventional practices by all team members (not just leadership) might be just what's needed to devise more challenging and realistic training exercises. Even during live incidents there can be a place for a collaborative leadership model – for instance, when developing an incident action plan for a never-seen-before incident simply following "the standard way" may not suffice.

Capability 3: Critical Decision Making

Critical decisions are those that can have a significant and possibly profound impact on the outcome of an emergency including property loss, damage to the environment and human harm. Level of difficulty in making critical decisions is determined in part by the allowable time period within which the decision must be made. A fireground team will routinely make split-second decisions. An incident action-planning group may have perhaps an hour to two to create a first iteration of their plan. The on-scene commander may have to make decisions in seconds and minutes depending on the nature and complexity of the incident.

In addition to tight decision time intervals, novelty and uncertainty can make decisions more difficult. Novelty becomes a source of difficulty when the decision makers have not previously encountered, planned for or otherwise anticipated the decision at hand. The catastrophic failure of the blow out preventer on the Macondo well during the Deepwater Horizon incident prompted critical decisions that had not apparently been anticipated. Deciding when to call in mutual aid or supplemental foam supplies for a tanker fire may be familiar and straightforward especially if pre-plans have accounted for the situation.

During complex, stressful, emergency operations, critical decision-making skills are vital to help ensure a successful outcome. Others have cited experience and knowledge as playing a pivotal role in decision making [6] that we agree with. We additionally advise a framework to move through the decision process in an orderly manner. While we do not offer a specific framework we do offer several guidelines, as follows.

- Identify the acceptable time frame for making the decision. Do we have seconds, minutes or longer to make the decision? Some may be "split-second", while others may be best served by a longer interval, e.g., deciding where to deploy a limited amount of boom when the spill calls for far more boom than is immediately available.
- Determine the objective of the decision and the reasonable choices. Simply stated, why are we making this decision and what are our choices? Is postponing the decision a favorable option or must we decide without delay?
- Evaluate the pros and cons of each reasonable choice, identifying any uncertainties, unknowns and ambiguities. For example, will applying water and foam to a burning offshore installation at the maximum rate cause the installation to capsize and sink? For longer duration incidents, the choices may need to be evaluated against future rather than current conditions. In other words, by the time the decision will be acted upon, will conditions be such that the decision will still be valid?
- If the decision is beyond the capa-

bility (experience, knowledge, etc.) of the team, seek outside help to the extent practical. For instance, perhaps the operating company has a crisis management support center that can provide additional expertise, decision support or poll other installations for advice and experience. Another possible source would be a third party available under contract, e.g., a company providing well blow out mitigation and recovery services.

Although we acknowledge there is no complete substitute for experience and knowledge, decision making is a capability that like others can be developed and refined. Training therefore can play a constructive role in developing this capability. The training will be most valuable if it addresses (1) the procedures of making decisions in an orderly, prudent manner and (2) the knowledge and subject expertise pertinent to the types of decisions to be handled. Simulations of a broad range of emergency scenarios can additionally offer a risk-free method of practicing and refining the decision-making capability so as to become better prepared for live emergencies.

Pre-planning is an essential precursor to making good decisions during emergencies. The 'what if' scenarios are discussed and committed to paper. Standard operating procedures (SOPs) are developed to handle those 'what ifs' as well as routine situations and tasks. Training and evaluation is performed based on the SOP contents. Over-training on SOPs allows for the development of 'institutional memory' in team members. When an emergency situation arises, the information contained in the SOP coupled with experience will bolster the decision-making capabilities of the emergency management team.

Capability 4: A Robust Organizational Structure

Much attention is given to the team's performance under the assumption that all key team members will be in place and ready to perform. But what happens if one or more members become unavailable on short notice either before or during an emergency. The impact of such an event could be significant, and adversely affect team performance.

An impact analysis is advisable to determine how robust the emergency response team's organization structure would be to a sudden loss of one or more team members or an abrupt degradation of their ability to perform. Key questions to address include: (1) will the team continue to function at satisfactory levels without this person? (2) do we have a backup for this person or other approach for dealing with the loss?, and (3) how long would it take for the team to get back on its feet (i.e., operational) if this person were to be suddenly removed from the team or incident? This analysis should be performed for each position and cover the full spectrum of emergency scenarios for the subject installation, vessel, terminal or facility.

Exacerbating conditions should be looked out for during the impact analysis – case in point, fire brigades whose members are not all conversant with the same language and in turn rely on a real-time translator to give and receive commands. The translator is a vital link in the intra-team communication; his sudden removal could cause a major breakdown. It is hard to envision a legitimate excuse for not having a sound backup plan for this vulnerability, yet we have seen it happen.

Capability 5: Situational Awareness

Situational awareness simply means being aware of your surroundings. An atmosphere where everyone maintains situational awareness should foster a safer environment. Loss of situational awareness occurs when an operator or team member develops an erroneous perception of the state of the environment and operating systems in relation to reality. McAllister [6] has identified a "direct relationship between situational awareness and safety management". What are some of the factors that affect one's situational awareness? Situational awareness can be adversely affected by the following:

- Complacency
- Distraction
- High stress levels
- Ambiguous instructions
- Unresolved discrepancies
- Lack of experience
- Lack of communication or coordination
- Fatigue, injury or illness
- Emotional pressure
- Fixation on one or two issues while ignoring others (tunnel vision) [5]

If and when a person feels that he or she has a 'gut feeling' that something is not right, it is usually an indication that perhaps situational awareness has been impeded. If, during the course of our workday someone utters the words, 'uh-oh', it usually means situational awareness has been compromised.

What tools can be used or developed to assist with helping us maintain situational awareness? The first item that will help is experience. There is no substitute for experience. One can take all of the courses available on a subject, but unless they have operated in the actual environment, there is something lacking in their situational awareness. Remember- we don't know what we don't know! Training can be used to assist us, but only if it is realistic and simulates ac-

Figure 2. *A drum explodes during a computer-based real-time training simulation*

tual conditions. In most emergency situations, we revert to the skills developed during our training. Training simulators that simulate control rooms in the offshore environment or on the bridge of a ship are excellent tools to help develop experience and skill sets.

An attitude that emphasizes safety over accomplishment is a conscious effort that must be encouraged and maintained. If a person acts professionally during routine operations, he is more likely to act professionally under the stressful situations encountered during emergencies. One's emotional and physical condition affects their perception of the environment. If someone reports for duty in a less than healthy or physically fit state, it will affect the perception of the environment and the person's situational awareness.

Other steps that can help maintain situational awareness involve:

- Maintain control of the situation. Maintain a global view of the situation, don't be distracted, focus, and utilize available time. Do not wait till the end of your shift in order to complete critical tasks. Time management is essential!
- Gather information from all sources. Do not limit your information gathering from a few sources. Use all available information, including technical indicators as well as subjective inputs like the "gut feelings" of others. Control room operators should 'look outside' once in a while to actually see what is happening.
- Limit distractions. During critical times of a shift where important tasks are being conducted, eliminate idle chatter. During important maneuvers of a ship such as mooring to a single point mooring, all unnecessary chatter on the bridge should be eliminated. The discussion highlighting what you did on your last family vacation can wait.

Capability 6: Rigorous Training

In our experience, emergency response teams striving to become an HPT or sustain their hard-earned and lofty status as an HPT require a more rigorous and comprehensive training program than may be commonly found in today's upstream and downstream facilities. In general, we find the deficiencies to include:

- Training scenarios are too simplistic and undemanding
- Full-scale exercises fail to impart realistic levels of stress, uncertainty and other demands
- The number and frequency of exercises are disproportionately low in comparison to the number of emergency scenarios within the team's scope of responsibilities
- Follow-through on the implementation of lessons learned and procedural improvements identified during exercises is often inadequate to ensure institutionalization.

We have pushed the training envelope for HPTs by utilizing training techniques that embrace the principles of immersive training similar to those espoused by Sobel [9] and leveraged computer-based simulations that have been developed by Varicom. These techniques have been applied in three forms of hands-on training, each summarized below.

Functional drills: Expressly for evaluating and developing functional skills like communicating, decision making, incident action planning, and others we put participants through demanding exercises which are evaluated against strict and standardized performance criteria. The process does not end with dissemination and discussion of evaluations; Successive exercises, some with challenging variations, are then used to confirm embracement of lessons and improvements. This technique affords participants the opportunity to develop and perfect important functional skills before delving into demanding full-scale exercises. In certain cases we'll administer the exercises through a web-based portal to reach and engage participants efficiently. This technology is especially useful in the verification step.

Computer-based Simulations: By utilizing a simulation tool developed by Varicom, emergency response teams work through simulated scenarios in real time. We'll typically use the simulator to run scenarios that are developed expressly for the participants' installation, vessel or facility. As a result, they benefit from experiencing meaningful scenarios that can be more extreme and demanding than otherwise possible, except perhaps in a live incident. As a general rule, we favor extreme, "never experienced before" scenarios in the simulator to help break participants out of their comfort zone that otherwise might be perpetuated through years of undemanding training scenarios. For example, see Figure 2. Additionally, because the simulator is portable we typically bring it to the participants' facility and scenarios can be run faster than real-time, the number of training scenarios experienced per unit of participant time can be noticeably higher than full-scale drills.

As a general rule, we favor extreme, "never experienced before" scenarios in the simulator to help break participants out of their comfort zone that otherwise might be perpetuated through years of undemanding training scenarios.

We also use the simulator for what we call "single-step simulations" whereby a particular situation is presented and the participants are prompted to develop and describe their proposed response. In effect, the participant is prompted as follows: "if this situation occurs, what would you do?" The single-step approach has been used successfully with groups who wish to discuss and agree on the appropriate course of action and as an evaluation tool for individuals.

Immersive Full-scale Exercises: The name of the game here is "make it demanding and make it real". Exercises that allow teams to merely "go through the motions" and put on entertaining "dog and pony shows" do no good in pushing the team's capabilities to exceptional levels. Full-scale exercises can be made demanding in a variety of ways – a complex scenario, physically taxing activities, high-amplitude distractions like smoke, load niose and in-

flux of superfluous information. Utilizing realistic, and challenging props can also make the exercise more demanding. With adequate degrees of realism present, the full-scale exercise offers a highly valuable forum for developing teamwork, perfecting functional skills, applying the appropriate leadership and incident management systems, and so on. Constructive feedback should ensue during and / or after the exercise with reinforcement of what was done well and corrective advice on areas of improvement. Having a well-defined and detailed set of exercise evaluation criteria that aligns with the team's metrics is vital to maximizing learning and pushing the team to new levels of performance. Of course, the exercises should be designed, managed and evaluated by experienced emergency managers and appropriate subject matter experts.

It is important to point out that the above training techniques are not intended for use in place of traditional techniques such as classroom training, table top exercises, etc.; we typically incorporate them into existing training programs.

Having lessons and opportunities for improvement out on the table, the challenge then becomes one of implementation and institutionalization. The follow capability addresses this important need.

Capability 7: Sustainable Implementation of Lessons and Improvements

Equally important as running effective training programs is an organizational change management process whereby benefits derived from training and actual incidents are implemented in a lasting way. While the need for such a process is lessened when the volume of lessons and improvement opportunities is kept small by having an underwhelming exercise program, this is indeed not the case when the training techniques described above are utilized. Rather, the rigorous training approaches espoused herein are more likely to kick out a relatively large number of changes deserving serious consideration and swift implementation.

In our work with companies in the oil & gas industry, we more often than not found neglect with respect to the implementation of changes that come out of training and evaluations. The most common case entails more of an informal information sharing process than a bone fide organizational change undertaking. For instance, following an exercise or a live incident in which current practices were found to need improvement, the emergency response teams at other facilities were notified by email and conference call. Such an approach readily allows the "broadcast" of changes to dwindle without a significant effort to implement them or verify that the changes are firmly engrained ("institutionalized") in the standard operating practices of the organization. An astounding example of this shortcoming is well documented in the US Coast Guard's after action report on the Deepwater Horizon incident [4, section 3.5]. Lessons learned in past incidents and exercises were not carried forward to the Deepwater Horizon incident.

What is needed is a formal organizational change management (CM) process, rather than a limited information sharing activity. This process should be wired in to not just training but also incident investigations and the after-action reporting processes. Lessons and improvement opportunities thereby become inputs to the change management process. The overall responsibility of the CM process should be to oversee and ensure proper implementation of changes based on lessons and improvements worthy of becoming institutionalized.

To successfully establish the CM process, commitment from senior leadership will be required as well as an appropriate dedication of resources well versed in organizational change. A key step in this new process must include verification of successful implementation. And in certain cases this verification step may need to be repeated multiple times to ensure permanence of the implemented changes. The importance of this capability should not be underestimated in respect to achieving emergency response HPTs. ■

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