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Simulation Based After Action Review

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Abstract

Every incident and operation presents an opportunity for learning and improvement. Translating these opportunities into organizational knowledge is a critical practice for any Dynamic Positioning vessel owner who aspires to high reliability operations. We present a methodology combining traditional after action review techniques with simulation to maximize the benefits of each learning opportunity.

We have observed that bridge resource management plays a significant role in many incidents, but that traditional after action reviews often struggle to highlight this. Simulator time enhances the after action review by allowing the participants and organization to probe human factors at the same time as technical areas. Initially defensive crews who are unused to close scrutiny of their actions are placed at ease by bringing them to a safe learning environment in the simulator environment.

Our paper will provide insight into the process by discussing in detail each part of the simulation based after action review: preparation, initial framing and review of event, open discussion, simulator exercises, closing comments and organizational learning. We will provide examples and feedback gleaned from the application of this process to our operations. Using this framework we have been able to create sustainable improvements in our crew competence across the fleet by allowing crews to learn from “real world” events on their sister vessels.

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Introduction

Dynamic Positioning in the Drilling Industry

For many years now, the offshore drilling industry has struggled with some fundamental challenges in Dynamic Positioning (DP) operations. By the very nature of our work drilling units endeavour to move and manoeuvre as little as possible. This results in long periods of ship handling inaction lasting perhaps days or even weeks between even simple operations like heading changes. Actual sailing of our vessels can be as infrequent as one short voyage every six months. No matter the experience level and previous history of our marine crews, we find that their performance in vessel handling can degrade as a result of normal drilling operations.

After Action Reviews (AARs)

> *"An after-action review (AAR) is a professional discussion of an event, focused on performance standards, that enables soldiers to discover for themselves what happened, why it happened, and how to sustain strengths and improve on weaknesses."*
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> *US Army TC 25-20, A Leader's Guide to After-Action Reviews*

AARs have spread far and wide since their formalization by the US Army in the 1970's. They are a core part of the toolkit in any organization that is focused on results and reliability. They help us examine divergence between intended and actual results, support the development of company culture and build on our strengths. However, ask most employees across the world what they think of when they hear "AAR" and you might get a disheartening answer. The canonical AAR is a table top exercise where the involved parties gather and discuss the events or operations in question. In some environments the AAR itself can become a box checking exercise, with limited discussion or a fear of openness destroying the value of the process.

AAR effectiveness is directly related to the candour and timeliness of the discussion, with the best AARs being held soon after the events being examined. Training aids such as charts, maps or models enhance the AAR further. Advances in technology have made computer simulation into a reliable tool for training and modelling systems and events.

Simulation Based After Action Review

Case Study

During a period of high loop current in the Gulf of Mexico, one of our drillships had sustained a significant position loss while making a heading change. The ability of a deepwater drillship to maintain its position relative to a fixed location on the seafloor is a foundational aspect of deepwater drilling. Complex dynamic positioning systems rely on multiple redundant means of determining position to a high level of precision and also provide systems with the necessary information for automatic power and thrust variation. All of this allows position to remain semi-static in spite of environmental forces.

As a result of this incident, we decided to conduct an AAR which is our standard practice to debrief and learn from our experiences. However, due to a number of questions raised about a whole host of features of the incident, we decided to add some additional scrutiny by siting the AAR in our NobleAdvances Training and Collaboration Centre. This centre is equipped with state of the art simulators capable of modelling the DP environment for each of our vessels.

Bringing a crew in to town for a discussion of a serious event carries with it a number of connotations which stand to hamper the free flow of information in an AAR session.

> *"Key is the spirit in which AARs are given. The environment and climate surrounding an AAR must be one in which the soldiers and leaders openly and honestly discuss what actually transpired in sufficient detail and clarity that not only will everyone understand what did and did not occur and why, but most importantly will have a strong desire to seek the opportunity to practice the task again."*
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> *US Army TC 25-20, A Leader's Guide to After-Action Reviews*

In an attempt to leverage our simulators as much as our meeting rooms we planned to hold a split session AAR, with the first segment being a typical table top exercise and the second portion being dedicated to simulator time. At this point we gathered the team and began our discussions using a traditional AAR methodology. After some dry discussions about the weather conditions and performance standards, we were struggling to get to the heart of matter. There was an undercurrent of defensiveness in the air created in part by the presence of line management, and the very probing nature of our questions. Despite making clear statements of intent that this should be an open session and that we were not allocating blame, it was a struggle to encourage the team to work together and fully participate in the AAR process. In the words of one of the facilitators:

> *"At the beginning of the discussion, there was misalignment, lack of trust and defensive postures adopted by the three crew members. They felt attacked by the facilitators and it was obvious that they did not agree about why the event had occurred. The morning session was spent discussing the failure and attempting to get the team aligned."*
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> *Noble Drilling Superintendent*

The afternoon session was carried out in the simulator and allowed the team to repeat the manoeuvre in a controlled environment. By pulling in the real world data from the bridge navigation systems on the vessel, we created an accurate simulation of the conditions the rig faced on the day in question. Our results were better than expected. Putting the crew back into their professional space and allowing them to work through the situation was enough to break the barriers that had stood in our way. With the team

aligned, we were able to run numerous simulations of different approaches to the event. This exercise ended with three team members aligned, understanding why the failure occurred and making recommendations about how they could improve.

> *"One of the biggest learnings I came away with as a manager, was the chance to observe the operators in a controlled environment, listen to their ideas, allow them to test and practice their ideas, but even more importantly, get a chance to observe how they plan and execute major heading changes in heavy environmental conditions. This has improved how we interact for such events or manoeuvres on the ship now."*
>
> *Noble Master*

What drew the team together and began to foster learning was the ability to use a simulator to recreate the operation and demonstrate a better way to achieve success. Everyone was able to try their own method and ideas and evaluate them in real time. By the end of the day we had made real progress in the crews' knowledge of how to plan and execute manoeuvres in tough conditions. Their positive experience led them to request the purchase of their own simulator console for the rig. This has enabled them to take what they learned not only about one event, but about the power of SBAAR back to their worksite and use it more frequently.

Methodology

SBAAR – A Blueprint

By their very nature, SBAARs require advance planning. The availability of suitable equipment is of course a requirement, as is sufficient knowledge of the simulator systems to be able to create a reasonable facsimile of the situation. Our suggested methodology is described here.

Preparation

Gathering the information needed to create a simulation of a complex and often chaotic situation is challenging. Often times it will require deep investigation of the events surrounding and incident. Our experience suggests the following data should be collected:

- Environmental data
- Data logs from DP system
    - Alarm log
    - Operator input log
    - Position plot
    - Power and thruster histories
- Bridge voice recordings
- Crew member statements

Time should be spent in independent review of the information gathered to fully understand what has happened. Information gathering is a critical phase of the methodology and should be performed as soon as the need is identified, before data is corrupted by the passage of time or perhaps lost entirely.

Initial Framing and Review of the Event

We now assume that the information is gathered, a simulation prepared and the participants gathered. While AARs can be performed by any group we recommend the inclusion of a neutral third party, preferably an experienced marine officer outside of the chain of command.

What we mean by “initial framing” is the presentation of the context of the AAR, its goals and its purpose as a learning tool, not as a process for the assignment of blame. Next we present an overview of the event to be discussed, including statements of the intended outcome and description of the actual outcome. At this time, we suggest avoiding entering a discussion of why we think this divergence between intended action and actual results has come about.

Simulator Exercises

> *“The use of simulators in AAR's allows personnel to practice their technical decision making in an environment where they are able to make mistakes without suffering the real-world consequences. In particular, after events where we made the wrong decision we are able to understand why the particular failed decision was incorrect and also learn what would have been the best choice given a similar condition.”*

Noble Drilling Superintendent

A key learning from many of our case studies was that participation and learning is vastly improved by getting the crew into the simulator as soon as possible.

One avenue to begin is simply to replay or relive the incident without too much discussion or change in parameters. This combines to build the teams trust in the simulator when they see similar results and also can freshen memories of the event where some time has elapsed. Depending on circumstances and capabilities the simulator session can be relatively free form or more structured. We have found that the structured or planned form produces best results. By having an idea of the types of things we wish to investigate, the participants can be guided through exercises that highlight the appropriate facets of the task. Some examples are: the effects of different weather conditions, varying input commands, equipment failures and response.

Absolutely key to maximizing the benefits of this portion is an analysis of bridge resource management and job planning among the crew. These are two areas in particular where the simulator allows and assessment to be made that might otherwise be obscured in a highly technical review. Only by direct observation of the working crew can a true assessment be made.

Open Discussion

After work in the simulator, we retire to a forum for discussion with is designed to be wide reaching. Every part of the day's activities, the circumstances of the incident and the performance of the team is fair game. By now, the crew may lead this discussion with minimal input from the facilitators – this is exactly what we want. Facilitators should strive only to keep things focussed and productive, while allowing the crew to draw their own conclusions about the results they have earned.

Closing Comments

This is a time to summarize what we have learned as a group. Often it is valuable to have each person describe what they will take away from the exercise. Finally, some consensus should be reached about the specific problems faced in the event being reviewed and the corrective actions or mitigations which will be put in place thereafter.

Organisational Learning

No AAR or SBAAR is complete without a way of capturing what has been learned and sharing it with the wider organisation. A solid process for organisational learning allows the value of individual exercises to be multiplied many times. In particular, this is valuable since some SBAARs can require significant resources to conduct. Leveraging the benefits as far as possible is only common sense.

Implications for DP Vessel Owners

SBAARs can shed light into places where many of us did not suspect problems. There are implications for several aspects of how we conduct business.

- Simulators on vessels – bringing crews to a central site for debrief is neither easy, timely nor cost effective if SBAAR is to be used routinely. At Noble, we have purchased simulator DP consoles for our vessels that are available on board. In this way we allow our crew to conduct their own SBAARs. While significant incidents are still reviewed centrally, wide access to simulation is a boon for day-to-day activities and training.

- A further implication of work site simulators is their use in pre-job planning. Far better to identify problems with a plan by simulation rather than in execution. This is particularly apt for the offshore drilling industry where there are long inactive periods between critical operations, therefore allowing sufficient time to plan in simulators.

- Incident libraries – SBAARs require the collection of data. Once event simulations are created they can be stored indefinitely and used to create a library of exercises. We have found that our crews respond better to training when they know that they are learning from the real world situations that they or their colleagues have found themselves in.

- Humans are naturally defensive when questioned over what could be perceived as their mistakes. By putting operational crews into their comfort zones i.e. a simulated bridge environment, they can be put more at ease and the discussion framed as a professional problem solving exercise.

- Human performance is a causal factor in almost all incidents. Observation of crew interaction by trained third parties can produce a wealth of information. This goes beyond human machine interface and into bridge resource management and even basic decision making. We strongly recommend that all DP vessel owners invest in robust BRM training for their crews. It is not enough to assume licensed personnel are already trained or proficient at the point of hire or promotion.