Fatality and Catastrophic Event Prevention

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Introduction

For the past 23 years, Mr. Williams has worked with some of largest corporations in the world helping their people to implement advanced safety processes primarily focused on human performance enhancement (advanced meaning beyond behavior based).

Human Performance and Catastrophic Event Prevention

I assume since you are reading this that you are a colleague, a fellow occupational safety and health professional or perhaps a manager. As such, we may be expected to improve the bottom line safety performance of the organization we are working for or with. Although applying engineering designs in ways that make safe operation less dependent on error free human performance is most desirable, we know that this is not always possible. A case in point might be flying small airplanes. They actually have fewer fail safes built into them than the larger commercial airplanes. In most industrial endeavors there are tasks humans perform that, like flying a small plane, are safe when humans perform well, but are terribly unforgiving when it comes to poor judgment and decision making. This article will address some advanced aspects of human safety performance, specifically how perceptions of risk are formed.

   If at some point on your safety improvement journey human performance becomes an issue, you shouldn't have any trouble justifying your efforts in that direction. If you are what might be called a "safety generalist" and want to tackle the human performance slice of the safety pie, you may need to prove to the organization (and perhaps yourself) that you are on the right track. To do this you will need to go back through the injury and unplanned event reports for the last year or two with key members of the organization.

By doing this you will be able to determine how many had a human performance issue as a contributing factor. More specifically, how many were preventable with "better awareness." Once this is done you can begin to ask the question: Awareness of what?

Perception Formation as the Key to Risk Recognition

In my experience, when we talk about preventable fatalities, catastrophic events or even recordable injuries, there was a risk present that for "whatever reason" was not accurately perceived. So, the focus of this paper will be to more deeply explore those "whatever reasons."

If you prefer the hazard recognition terminology that is fine, it still means that the hazard present was not accurately recognized and the "whatever reason" has to do with perceptions. If what we are dealing with is in fact a problem of perceptions, we might need to know a little more about how they are formed. Although this next portion might seem a bit theoretical, I would challenge the reader to come up with a better explanation (which you may well be able to do since we are all pioneers here in the area of creating and applying advanced safety systems).

I would be first to agree that how perceptions are formed is a complex issue and that there are things that we do not know. On the other hand, there are things relative to perception formation that we do know. For example, we know that we as humans take in sensory inputs from the five senses, sight, sound, taste, touch, and smell. We know that these form streams of information that go into our brains. As you are read this article, the words on the page are forming a stream of information that at this moment are entering your brain. These words are being perceived by you to have greater or lesser value. If your cell phone rings while you are reading this, that is a second stream of incoming information and you will quickly decide which stream of incoming information gets your attention or focus. So one of the issues with people not accurately perceiving the risk present, is simply people not having their focus where it needs to be (meaning on the correct incoming information stream).

Perceptual Bias

We also know that before perceptions are formed the incoming streams seem to be filtered through things like emotion, bias (including confirmation bias), our sense of urgency relative to a particular task or situation and other factors. This might explain why a person might do something that is totally out of the norm for them and why they often cannot tell you why they did what they did.

If you would like a simple example of how an incoming information stream might get filtered through bias and maybe even a little emotion, allow me to offer this. Imagine a horizontal line on a piece of paper with the word "good" written on the left side and the word "bad" written on the right side. I am going to furnish you with two streams of incoming information in the form of one word each. My bet is that for most people in the U.S., one of these words will go onto the good side of the paper and the other will go to the bad side. Shall we try this? The two words are

Democrats and Republicans. Hopefully you can see from this demonstration that those incoming information streams are in fact filtered through bias as our perceptions are formed. What has this got to do with safety? What if the bias in those filters were not political but was more along the lines of "it won't happen to me?" And, what if that type of bias lead us to routinely look at a task with less than certain data and make "best case assumptions?" What if that kind of thinking had been rewarded and reinforced for years by the highest levels of management? Shortly, I will present a case study and ask you to draw your own conclusions.

Confirmation Bias

For those not already familiar with the concept of confirmation bias, it suggests that we as humans tend to see or perceive what we are *expecting* to see or perceive. A good example of this would be people in cars leaving a stop sign only to collide with a motorcycle rider who had the right of way. In most cases the driver of the car will tell you that they simply did see the motorcycle. Why? They were looking for and expecting to see a car. Proportionally these type of accidents have become fewer in the last couple of decades. I would suggest that the reason for this is twofold. First, there are more motorcycles on the road today so we have become more conditioned to accurately perceive their presence. Second, a large number of the motorcycles today share the big twin type engine designs made popular by Harley Davidson. As you have no doubt heard, these big twins are often fitted with loud pipes which give car and truck drivers a second stream of incoming information (audio) with which to perceive their presence on the road.

On the subject of perceptions, so far we have mentioned focus, that is choosing the correct incoming information stream and how that incoming information might get filtered at a particular time. It would probably be a mistake to believe that these stay absolutely constant with people irrespective of what their stated priority for safety might be. For example, going through a divorce is one of the many things that might change how the incoming streams of information are filtered.

Perception Formation and Risk / Hazard Recognition

The third facet of perception formation might be how that incoming information stream is categorized after being filtered to form the actual perception relative to risk. In other words for any particular task or situation, we have to have some focus on that task or situation to form an incoming information stream. If we are looking the other way at birds flying overhead, no risk perception related to that task is formed.

For the streams where there is focus on a specific task, the incoming information stream gets filtered (or mentally processed) as we mentioned earlier, and that stream seems to then flow into a perceptual category relative to risk. To better understand this we might once again draw a horizontal line or continuum with high risk on one side and low risk on the other side with moderate being somewhere in the middle. For any particular task or situation we focus on, that

incoming stream of information gets filtered and a perception of the risk is formed that falls somewhere along our continuum.

This Task

High Risk--Low Risk

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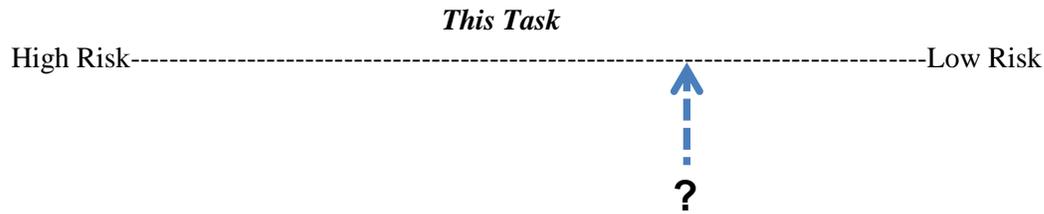
Hopefully we can agree that when a preventable fatality or a catastrophic event happens there was in fact risk present that was not accurately perceived. Let me give you a concrete example. In October of 2008, the Texas Gulf Coast was hit by Hurricane Ike. We knew this was going to be a serious storm, there were even law enforcement officers going door-to-door along the coast to warn people that they were under a "mandatory evacuation." The law enforcement officers then left the area themselves. Most of those people along the coast did as they were told and left. However, seventy-two people misjudged the level of risk, attempted to ride out the storm, and died as a result.

Before I get into our case study, I need to let you know that everything I mention here and more is a matter of public record and readily available if you care to do the research (meaning that we are not giving away any secrets). Also, it is going to be a challenge to present the facts of this case study without it sounding to some degree like a "been there done that" sales pitch but I will do my best.

I will begin by acknowledging that our role in this transformation was not that important. In my opinion, what turned this situation around was what a few key people did with what we had given them. This study involves a large refinery in Texas that had averaged a fatality a year for thirty years. In addition to these thirty, fifteen more people perished a single explosion event in 2005 bringing the total to forty-five fatalities over a thirty year period (Curly, 2009). Another interesting fact; this facility had implemented a conventional Behavior Based Safety (BBS) process ten years earlier that was still active. When implemented, that BBS process did reduce the recordable injuries, but apparently did nothing to lessen the rate of fatalities. I am a big advocate of BBS methods and believe on a deep level that they should be an integral part of every safety portfolio. However, I have to admit that BBS has a limited capacity. These shortfalls are particularly visible in the area of enhancing perceptual accuracy and other factors that influence the thinking that drives behavior such as levels of awareness and impulse driven actions.

The Case Study

 We were engaged in January of 2009 and although that facility has changed owners, there has not been a fatality since (a little over six years at the time this article was written). To be both fair

and accurate, I need to let you know that the United Steel Workers (USW) began training on their Triangle of Prevention (T.O.P.) process at about the same time our training began. For those who might not be familiar, the T.O.P. process is not only focused on finding and correcting unsafe conditions proactively, there is an in-depth accident investigation component also primarily focused on conditions. This wound up being a particularly good fit since our process focused more on factors that influence human performance such as levels of awareness, impulse management, and perceptual accuracy or hazard recognition. With forty-five fatalities in a thirty year period, I think we can agree that we were dealing with a culture where there were very significant problems relative to people accurately perceiving risk whether it was a condition or behavior.

So, how do we go about striving for more accurate perceptions? This team consisted of mostly hourly or union people with a management sponsor and a salaried safety engineer on board. After we trained this team, a few of the union people took these advanced concepts (levels of awareness, impulse management and perceptual accuracy) and trained everyone in the plant in a four hour session. Since we have to limit the scope of this article, I will be discussing only enhancing perceptual accuracy, which was what the team deemed to be the most potent of these three concepts. After reviewing the fatalities they agreed that all of them and most of their recordable injuries were preventable. They also concluded that almost all had a human performance component as a contributing factor. Specifically that there was risk present that was not accurately perceived. So, where exactly was the perceptual breakdown?

To better understand this question the group formulated a rather complex risk matrix / perception enhancement model which they called "Exception to Safe Work Practices." Below the model were three questions: Below this rather complex model they had wording which essentially stated that there was a concern for the way that a certain job was being approached. The document went on to say that if the job could not be stopped for a deeper review, the supervisor or manager over that job would sign this "Exception" document. By signing the document, (which as far as I know never actually happened) that supervisor or manager was acknowledging the serious safety concern but insisting that the work proceed without further review.

How did it work in practice?

The truth is I am not 100% sure. All the work we did was classroom and what I have to offer here is based on feedback that I got from various members of that team about what actually went on in the field. What I do know is that this was a more systematic approach than what had been happening in the past. In the past, if a concern was raised it was often dismissed as simply one person's opinion and the work proceeded unchecked. This new approach offered a systematic way to stop work. It was also now done in a way that eliminated the chance of discipline from insubordination since no one was refusing to do the job. It was nonetheless having the desired effect. The feedback I got from the field also revealed that use of the original complex model was short lived. It soon morphed into a much simpler version with fewer parameters and in some

cases the written instruments created were not used at all. However, by this time what was on the "Exception to Safe Work Practices" document was well understood and there was always the option to get the "Exception" paper to be signed if need be. I thought at first that this was bad news but, the reality was that a simpler, less formal approach turned out to be something people were more likely to actually use in the field. Even with the simplification and the chance of insubordination removed, I am still not sure how many questionable jobs were stopped by individuals. I think in many cases the union safety reps were called and they stopped the questionable jobs since they did not have to work directly for that supervisor.

The Idea of Ideal Complexity

This brings us to the idea of "ideal complexity". Almost every organization has some sort of risk assessment instrument or model they either designed or adopted to help people better recognize or more accurately perceive the level of risk. The question is how often and to what degree are people in the field actually using it? The idea of "ideal complexity" therefore would mean a risk recognition tool that was complex enough to be effective and simple enough that people were actually using it. Especially those people who were typically exposed to the most risk (hourly people).

The questions being asked most in the field were these. What is our degree of certainty, what are we assuming, and have we considered all the incoming information streams that could affect this job? (Jewell, 2009a) Three simple but apparently effective questions.

Later, some of our other teams put those questions into graphic form as seen below:
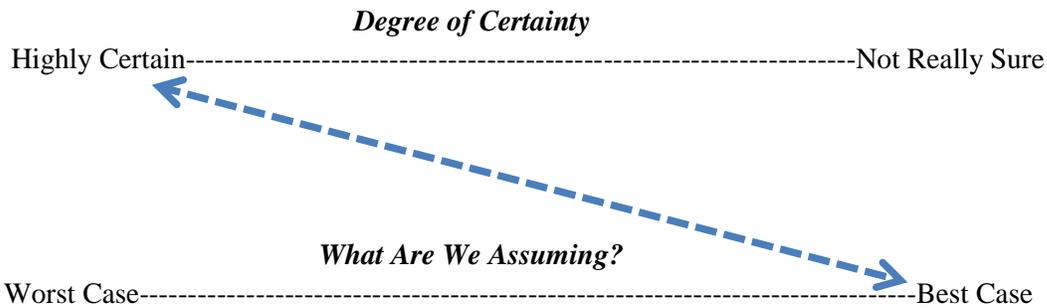
Degree of Certainty
Highly Certain--Not Really Sure

What Are We Assuming?
Worst Case---Best Case
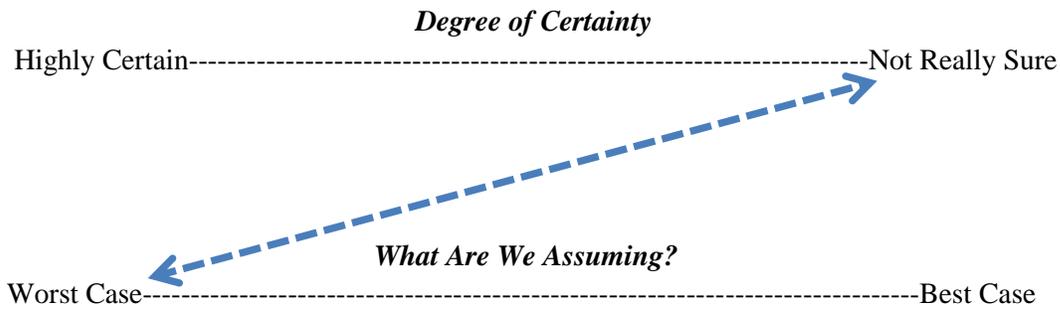
Have we considered all the incoming information streams that might affect this task?

If you are an OSH professional there is a good chance that at some point in your career you may be placed in a union environment. When that happens it is not unusual to hear some managers say that some of the union's safety concerns are more driven by a motive to slow down a job rather than a concern for safety. While that may have some validity in some organizations, in this case experiencing forty-five fatalities in thirty years made that notion an easy one for these people to push back against. I am convinced that in this case the people who were routinely exposed to the most risk (hourly) were genuinely trying to get the rest of the organization to develop more accurate perceptions relative to risk.
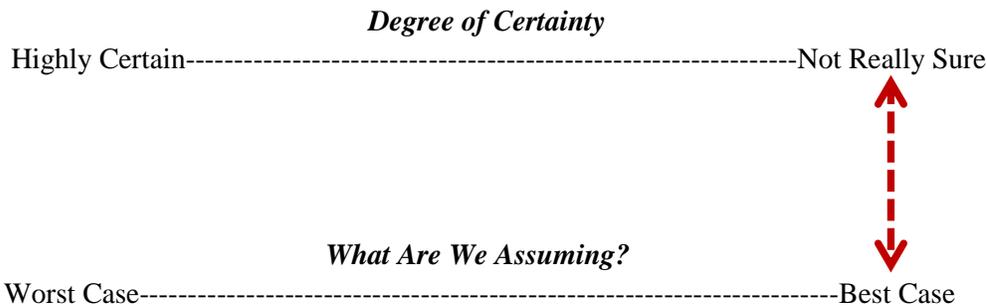
Degree of Certainty

Highly Certain--Not Really Sure

What Are We Assuming?

Worst Case--Best Case

Have we considered all the incoming information streams that might affect this task?

The idea here is that the higher our degree of certainty about a situation or being able to perform a task, the more we can allow ourselves to make "Best Case Assumptions".

Degree of Certainty

Highly Certain--Not Really Sure

What Are We Assuming?

Worst Case--Best Case

Have we considered all the incoming information streams that might affect this task?

Conversely, the less certain we are about a situation or activity the more we need to be considering worse case scenarios. Some safety professionals might argue that the safest thing to do is always insist on a very high degree of certainty ***and*** assume the worst case scenario. That might be the safest and even necessary on very high risk tasks such as lifting distillation towers into place. However, it is unrealistic and a very hard sell for the day-to-day activities which is where most of the thirty fatalities in question happened. In fact, that degree of caution could also lead to the accusations of stonewalling a job that we mentioned earlier. You as a safety professional, leader or manager will have to develop and operate within a set of risk recognition parameters that are both realistic and effective. Parameters which will allow your people to see that where we get into trouble is routinely making best case assumptions with a low level of certainty as depicted below.

Degree of Certainty

Highly Certain--Not Really Sure

What Are We Assuming?

Worst Case--Best Case

Have we considered all the incoming information streams that might affect this task?

The team at this refinery discovered that they had a culture where it had become routine not to consider all the factors that could affect the completion of a task ***and*** to make "best case assumptions." In addition, this was going on without the needed degree of certainty relative to potential outcomes on tasks they were about to do. By the way, this type of thinking is exactly what killed those seventy-two people during Hurricane IKE.

It might be worth mentioning that not only did the fatalities at this facility abruptly stop, the two years that followed implementation proved to be the safest in the fifty plus year history of that refinery which has since been sold (Rushing, 2011). So, if they had a mature fully functioning BBS process, what turned the situation around? Having the USW's T.O.P. incident investigation process no doubt helped, and yes we helped facilitate the team through the creation of an employee designed advanced safety process that went deeper than BBS. However, in my opinion, the bulk of the credit belongs to a small group of what I consider to be exceptional union people. In addition, this could not have happened without a few progressive thinking exceptional managers and engineers that helped create the right environment for this change to take place. What did these exceptional people do? They created a systematic way to openly challenge and refuse to act on some of these questionable perceptions and decisions and did it in a way that avoided a charge of insubordination. More importantly they ***used*** what they had created.

It is worth mentioning that this approach wasn't limited to supervisors and managers, it was also used by the some of the union safety representatives with some of their "risk taking" peers. (Jewell 2009b)

The former top managers at the corporate level of this organization have moved on, and in my opinion, this is a greatly improved and much more safety minded organization today.

We have deliberately left out the explosion in 2005 that took the fifteen lives as part of this discussion since there have been several articles and books written about that event. Suffice it to say that this too was preventable, had a human performance component, and may in fact have been prevented if this team's risk perception enhancement approach had been in use at that time. If you would like to learn more about the 2005 event, the book by Andrew Hopkins entitled "Failure to Learn" explores factors that led to that event in great detail. I am not convinced that all

his conclusions are accurate but the actions and conditions leading up to the event are well documented.

The thirty fatalities which this discussion did address were a mixture of contractors and company people. What is interesting is that most of these fatalities happened on what were considered to be routine tasks *and* continued even after the explosion in 2005 with the last fatalities being two company people in 2008.

IN SUMMARY

Hopefully we have created some interest in the relationship between risk recognition and perception formation as perhaps a frontier worthy of further exploration. Hopefully you will also begin to tinker with the idea of "ideal complexity" relative to your risk recognition instruments while keeping in mind what group of your people is most likely to be injured.

I believe this case study shows that even in a situation where systemic problems at a high level are creating a "best case assumptions" culture, safety can begin to be managed from the bottom up.

Most OSH professionals that I have had contact with recognize BBS as an important step in the evolution of safety enhancement methods but one with significant limitations. I will ask the reader to draw their own conclusions on these next questions. Has the time come to take the next step, to explore other innovative human performance enhancement methods that go beyond BBS without losing that one? If so, what will that look like and will you be someone that helps to make it happen?

CONCLUSIONS

Refining crude oil would fall easily into the high risk category as far as jobs that people could potentially have. The point here is that with the right tools and motivated people in place to see that they are utilized, we don't have to kill **or even injure** our people to do what we do in the refining business or any other business. This statement may sound absurd but it was proven by a different refinery in a different state. The Tesoro (Formerly Shell) Refinery in Wilmington California in 2011 was able to complete that year at zero / zero (that is no recordables for company people or contactors). While this is a rare feat for the refining industry, it does show that it can be done. I think it also shows that as an organization, it's not what we are that matters; it's what we are able to become.

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