Improving Worksite Safety Participation and Performance

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James Reason is a well known industrial psychologist who has produced a scheme of human error classification which makes what might seem a difficult subject available to all with a concern for safety. His primary work was in civil aviation and is now underpinning recent movements to improve safety and quality in health service delivery. Critical to Reason's approach is the development of what he calls a "just culture", one where vital information about the errors that people make is made available.

Consider the following:

I am a MANAGER and I KNOW that:

- I hear about the 'unexpected' in our operation
- our decision processes may be error prone
- our procedures are followed and evaluated
- we don't have any 'loaded guns' lying around, and we aren't introducing any
- our plant is error tolerant
- we are preoccupied with failure
- I hear the 'bad news'

HOW do I Know ???

I am a SUPERVISOR and I WILL:

- brief my crew
- check that procedures are up to date / useable
- watch my crew for the 'unexpected'
- check that I have up to date information
- encourage my crew to tell me about the 'unexpected'
- report the 'unexpected'

HOW will I ???

I am an OPERATOR and TODAY:

I shouldn't have:

- bent or broke a rule
- slipped or tripped
- had a lapse of attention

- cut a few corners to get the job done
- missed a step in a procedure (or got it wrong)
- tried to fix something – but didn't

But I did – and it's OK !!!

I'll tell someone !!!

What do these questions and statements mean ?

Put simply, they are a measure of an open organisation where the 'bad news' travels from the bottom to the top. This is what was described by Reason as a “just culture” wherein messengers are not shot, belittled or punished but are embraced !

While there is a natural emphasis on the 'positive' you also need the negative, the 'bad news' which tells how things are really going. In this respect the 'bad news' is really 'good news' !

The reality of life is that people make errors – they don't always get things right or do what is expected of them. By capturing and considering these errors much can learnt about the integrity of systems of work.

For example, there has for some time now been a preoccupation with safety management systems in one form or another. At the heart of these systems are procedures which must be followed to ensure the integrity of the system. Many safety management or other systems are surprisingly fragile and a fairly simple failure by an individual to accurately follow a procedure can bring a complex (and expensive) system to its knees.

A couple of examples, the first with a little rocket science:

US$1,233M plus Oops (in 1999 money)!

The Loss of a Milstar Satellite

An example of an active error triggering a number of latent errors.

On April 30, 1999, at 12:30 EDT, a Titan IV B-32 booster equipped with a Centaur TC-14 upper stage was launched from Cape Canaveral. The mission was to place a Milstar-3 satellite into geosynchronous orbit. Milstar is a joint services satellite communications system that provides secure, jam resistant, worldwide communications to meet wartime requirements. It was the most advanced military communications satellite system to that date. The first Milstar satellite was launched February 7, 1994 and the second was launched November 5, 1995. This mission was to be the third launch.

As a result of some anomalous events, the Milstar satellite was placed in an incorrect and unusable low elliptical final orbit, as opposed to the intended geosynchronous orbit. Media interest was high due to this mishap being the third straight Titan IV failure and due to recent failures of other commercial space launches. In addition, this accident is believed to be one of the most costly unmanned losses in the history of Cape Canaveral Launch Operations. The Milstar satellite cost about $800 million and the launcher an additional $433 million.

To their credit, the accident investigation board went beyond the usual chain-of-events model and instead interpreted the accident in terms of a complex and flawed process:

> “That failed process did not detect and correct a **human error** in the **manual** entry of the I1(25) roll rate filter constant entered in the Inertial Measurement System flight software file. The value should have been entered as **–1.992476**, but was entered as **–0.1992476**. Evidence of the incorrect I1(25) constant appeared during launch processing and the launch countdown, but its impact was not sufficiently recognized or understood and consequently, not corrected before launch.”
>
> MIT OpenCourseware

From little things ...

A simple little data entry error brought the might of the US space program to its knees – incredible but true !

Another example, this time a lot closer to home.

A grader was operating in a now relatively unused part of an open cut mine. It was operated by a contract driver. Part of the job involved the grader having to cross a haul road that was now little used. The traffic control arrangements in place at the mine required the grader operator to contact mine control and let them know that he would be working in the area. Presumably, they in turn would alert him to the potential for the haul road to be used during his shift.

This, on the face of it, seems a fair enough arrangement.

However, the contract grader driver was sent to the mine one day to complete an urgent part of the job when he didn't expect to be. In the circumstances he forgot to notify mine traffic control. During the shift he went to drive the grader across the haul road. There was a 240 tonne haul truck using the road on the day – the truck driver didn't see the grader. The grader driver wasn't looking for trucks. Wham – lots of damage to the grader and the driver lucky to be alive while losing the sight of an eye.

When this event is analysed in human error terms it is revealed that a moments inattention on the part of the driver at the start of his shift set up the whole sequence of events. In other words, as in the case of the satellite, a fairly simple human error brought what seemed a reasonable system of safety management undone.

The study of human error in relation to accidents has two preventative aspects in mind:

1. to reduce the likelihood of human error in the first place, and
2. in the event of an error occurring to reduce its consequences.

So what form might this important human error information take ?

There are some clues in the points above but it can be made much clearer by further considering the work of James Reason. Reason identified three basic types of human error:

- Slip / Lapse
- Mistake, and
- Violation

The following excellent definitions are taken from HSG(48) – reference at end of paper.

“**Slips and lapses** occur in very familiar tasks which we can carry out without much need for conscious attention. These tasks are called ‘skill-based’ and are very vulnerable to errors if our attention is diverted, even momentarily. Driving a car is a typical skill-based task for many of us. Slips and lapses are the errors which are made by even the most experienced, well-trained and highly-motivated people. They often result in omitted steps in repair, maintenance, calibration or testing tasks. We need to be aware of these types of errors and try to design equipment and tasks to avoid or reduce their occurrence. We can also try to increase the opportunities to detect and correct such errors.”

“**Mistakes** are a more complex type of human error where we do the wrong thing believing it to be right. The failure involves our mental processes which control how we plan, assess information, make intentions and judge consequences.”

“**Violations** are any deliberate deviations from rules, procedures, instructions and regulations. The breaching or violating of health and safety rules or procedures is a significant cause of many accidents and injuries at work. Removing the guard on dangerous machinery or driving too fast will clearly increase the risk of an accident. Health risks are also increased by rule breaking. For example a worker in a noisy workplace who breaks the site rules about wearing ear defenders increases their risk of occupational deafness. Our knowledge of why people break rules can help us to assess the potential risks from violations and to develop control strategies to manage these risks effectively.”

It is beyond the scope of this brief paper to fully consider the types of preventative measures which are likely to be most effective for each type of error. A very good example, however, is that training of itself is unlikely to be an effective response to slip/lapse errors. Another is that violations may well be a very good indicator of 'safety culture' and that their prevention may well lie in improving that culture.

Conclusion

There is a recognised danger in the development and implementation of various health and safety management systems that they are seen as 'turn key' engineering systems. You wind them up and they go.

Nothing could be further from the truth. As the examples above illustrate, a safety management system is as good as its 'weakest link' – the fallible people who function in it. Considering human error provides a not too difficult means to come to terms with the 'human factor' and so make more robust systems – and save lives ! But this requires a 'just culture' where participation can lead to performance.

References:

HSG48 Reducing Error and Influencing Behaviour
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