



Expertise and Effective Office Warning Strategies

Advanced Warning Operations Course
IC Core 3

Lesson 3: Learning From Post-Mortems

Warning Decision Training Branch



Welcome to the AWOC lesson on Learning from Post-Mortems.

What You *Don't* Want to Read in Tomorrow's Headlines...

"The tornado...struck without warning...no sirens to announce its approach."

"By all accounts, the tornado that tore through struck with almost no warning..."

"There was no warning..."

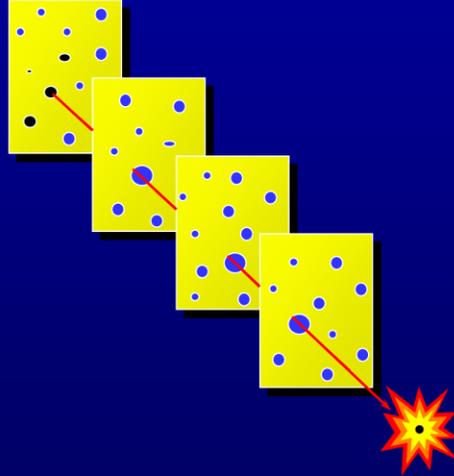
"Differences experienced today compared to forecasts issued only hours earlier were glaring and primary contributors to our holding difficulties."

"Officials had little warning. 'By the time we knew it was coming, it was already on the ground.'"

Anyone who's worked a significant weather event has seen headlines the next day which may or may not reflect the service provided, but nonetheless are extremely troublesome. In some cases, the office would have been hard pressed to get a better outcome. In others, actions before and during the event show room for improvement. An honest post-mortem will help us know where improvement can be made, whether it is in understanding the science, better technology, or human factors related issues.

Overview

- The value of post-mortems
- How to prevent an ineffective post-mortem
- Post-Mortem challenges
- Post-mortem databases
- Types of post-mortems in the NWS



A post-mortem has many potential benefits which we will discuss. However, just going through the motions doesn't mean you will reap all the benefits. The post-mortem must avoid certain pitfalls. In addition, having a database constructed of post-mortems from numerous events and offices can reveal systemic issues (both good and bad). We will look at the term "human error" and discuss its meaning and relevance. We will also discuss some of the challenges with assessing decision making in real-time, while already knowing the outcome (outcome and hindsight biases). Finally we'll discuss the types of post mortems used in the National Weather Service (NWS).

Learning Objectives

1. Identify the potential benefits of a post-mortem
2. Identify characteristics of an ineffective post-mortem
3. Identify what is meant by human error
4. Identify the impact of hindsight and outcome biases on a post-mortem
5. Identify the value of a post-mortem database

Here are the objectives we will address in this lesson. Please take a moment to read them and then advance to the next slide when ready.

Post-Mortem Definition

 **Post Mortem** - A detailed examination or evaluation of some event just ended.



*“Post-mortem examinations
provide valuable information ...
and can provide vital information
for future treatment and research.”*

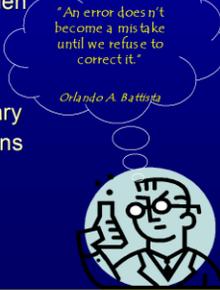
The Royal College of Pathologists

A post-mortem is “a detailed examination or evaluation of some event just ended.” No mention of whether that event had a good or bad outcome. Post-mortems can not only tell us about the past, but can help point us in the direction of needed research, technology, policy, or procedures.

The Value of Post-Mortems Tie to Expertise

8) Experts manage their own limitations

- See inward – thinking about thinking
 - Have good SA and can tell when losing it
- Perform self evaluation
 - Personal post-mortems
- Modify strategy when necessary
- Work around memory limitations



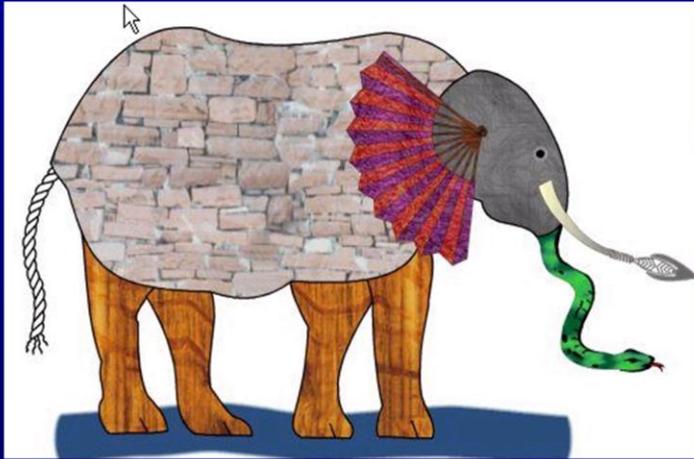
People develop and maintain expertise by doing post-mortems.

From AWOC Core – Lesson: Expertise

One of the most important benefits of a post-mortem is that it helps people develop and maintain expertise. It doesn't necessarily have to be a formal, published post-mortem either. It just has to delve deep enough to identify causes, effects, and actions that can be acted upon during future events.

The Value of Post-mortems

The Inclusion of Many Perspectives



"Though each was partly in the right, and all of them were wrong."
John Godfrey Saxe's (1816-1887) version of the legend

A good post-mortem will include many perspectives. In the old legend depicted here, each person had a hold of a different part of the elephant, and each then described an elephant based on the part they had in their hand. "An elephant is like a rope", said the guy holding the tail. "No, an elephant is like a snake", said the guy with the trunk. In reality, the elephant was like none of these individually, but all of these collectively. Your perspective of what happened in an event may be totally different than that of the gal working the other desk. Together, your perspectives give a more complete picture of what really happened.

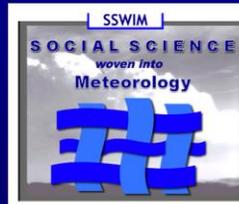
The Value of Post-mortems

The Inclusion of Many Perspectives (Cont'd)

“Given an identical problem, an engineer will find an engineering solution, a programmer will find a programming solution, and a sociologist will find a societal solution. A best solution will often involve all three.”

Dr. Dennis Mileti, Former Director

Natural Hazards Research and Applications Center



Unfortunately, traditional post-mortems have usually only included the perspective of one domain, which results in a solution originating in that domain. A post-mortem which involves research, operations, and something representing the users will take more effort but may be the key to solving outstanding issues. This quote from Dr. Mileti represents a desire to expand the problem solvers. A more recent effort at integrating many perspectives in problem solving comes from the WAS*IS initiative which led to the SSWIM Program, started by Dr. Eve Gruntfest. This approach integrates social science into meteorological research and practice when looking for solutions to problems.

The Value of Post-mortems Assist All Levels of an Organization



Office –
Where can local management help?

Me –
Where do I need help? In what areas am I strong?



NOAA'S NATIONAL WEATHER SERVICE STRATEGIC PLAN 2011 – 2020

Final Copy for NEP Review
November, 2010

www.weather.gov/com/stratplan

Mission

Provide weather, water, and climate data, forecasts and warnings for the protection of life and property and enhancement of the national economy

Goals

- Improve weather decision services for events that threaten lives and livelihoods
- Deliver a broad suite of improved water forecasting services to support management of the Nation's water supply
- Enhance climate services to help

Agency –
What is agency's contribution? Where do resources need to be spent?

A post-mortem can offer insight for any level of an organization. For the individual, he or she can see in what areas they are strong and in what areas they need help, whether it be practice with a new software tool, additional understanding in the science, or a better comprehension of how the operational strategies employed by the office are meant to be. Local management can see what is working and what is actually impinging on forecasters ability to do the job, including office policies (official and unofficial), roles and responsibilities or way in which workload is distributed. The agency can see if the same issues are occurring at several sites and look at policies and procedures which are contributing to these issues.

The Value of Post-mortems

Help Pinpoint What's Wrong



There is nothing worse than having a negative experience and then going on to the next event without knowing why it was so negative. If you can't figure out what went wrong, how will you be able to learn and prevent it from recurring? "Tornado struck without warning" is not enough information, just like "some sort of error" is not enough information.

The Value of Post-mortems ...And Leave Alone What's Right

Don't Implement a fix without truly understanding the problem.



Problem: FAA records showed runway incursions on the increase.

Solution: Paint wider stripes at intersections so pilots can see them.

Results: Runway incursions continued to increase.

Upon further review: Turns out most incursions had been caused by miscommunications or failure to follow protocol... not by pilots failing to see intersection lines!

A consequence of not understanding the problem is an increased likelihood of repeating it. A consequence of misunderstanding the problem can be implementing solutions which are irrelevant. In this case, an increasing number of runway incursions was attributed to pilots not being able to see the markings on the runway. So the solution was to paint wider markings. When the mishaps continued to occur, a second and more thorough look found out that runway markings weren't the issue at all. Implementing a solution before understanding the problem in this case was a waste of time and money, and more importantly, didn't help prevent future mishaps.

Post-Mortems Don't Play the Blame Game!



"We have learned the futility of trying to *understand* when people are afraid of *blame*."

*

B. Nelms, FAILSAFE Network

One of the BIG obstacles to doing post-mortems is the perception that the effort is designed to place blame. If that is true, then most of those involved will expend their energies to ensure the amount of blame they take on is minimal. And who could "blame" them? Research has shown, and your experience probably tells you, that once people suspect the process is all about punishing the "guilty", then the process is hosed. Part of that may stem from historic efforts which only look at cases where the outcome was bad. It's a compelling reason to look at all cases. Another problem has been in the failure to recognize that there are numerous contributors to outcomes, good and bad, at all levels. To affect real change, we must consider all levels, and consider how the entire process came together during the event.

Post Mortems

The Danger of Finger Pointing



From this...

**“What is it about
the way I am
that contributed
to this event,
and
what do
I intend to do
about it?”**

Bob Nelms, Failsafe Network



...to this

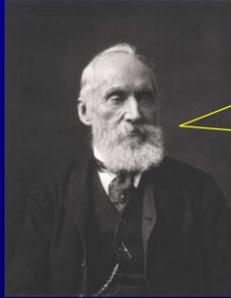
The need to finger point and place blame on someone who can take the fall is counterproductive. Much more beneficial is to see how each of us contributed to some outcome in our own way.

How to Prevent an Ineffective Post-Mortem Avoid Categorical Thinking

- Keep an open mind and avoid preconceptions

“The history of the field is littered with brilliant scholars who completely missed the boat because of the power of their preconceptions.”

- Mark Davis, *Into the Fray*
(PBS)



“Radio
has no
future.”

Lord Kelvin English scientist, 1899

Apollo Root Cause Analysis, 2002

When we go into an event with a strong perception as to the cause, it can result in missing important information. Sort of like when you decide that tornadoes aren't going to happen today and you therefore never check for velocity couplets. It's like having blinders on. The more open minded you can be when reviewing an event, the more likely you are to discover things you hadn't anticipated. As Mr. Davis says, the power of one's preconceptions can cause us to totally miss the boat. No doubt Lord Kelvin would like to have had the opportunity to take this statement back!

How to Prevent an Ineffective Post-Mortem Avoid a Favorite Solution

- Solution oriented (preconceived *solution*)
 - “Favorite solution” mindset
 - *Work in “preferred” solution rather than understand cause*

“The leaders had a preferred solution and engaged in behaviors designed to promote it rather than critically appraise alternatives.”

Moorhead, et al., *Group decision fiascoes continue: Space shuttle Challenger and a revised groupthink framework. Human Relations*, 44

- Causal relationships are unknown
 - Fact finding does not reveal cause and effect

Apollo Root Cause Analysis, 2002

The one who goes into an event with a “favorite solution” in mind will no doubt find what they are looking for... somehow. There can be all kinds of reasons for this approach, most of which are left for your imagination, but the end result can be that real and meaningful cause and effect are left out, and therefore not addressed in the solution. The article from Moorhead et al in *Human Relations* points to the dangers. Finally, it's important to not just get facts but get “stories”. Some of the most important information can be gleaned when people recount events. One of the things that gets left out with just the facts is how pieces of information fit together...their causal relationships.

How to Prevent an Ineffective Post-Mortem Maintain a Positive Attitude and Conduct

"In both cases, the report says, NASA accepted some recurring malfunctions without recognizing underlying risks."

Columbia Accident Investigation Board's final report, USA Today, 8/27/03.



| GND | PASS | BFS | TRK | PASS | BFS |
|----------|----------|----------|---------|--------|---------|
| SITE | KSC33 | KSC33 | RGO | **** | 1025.00 |
| HACID | GND R | GND R | VREL | 4931 | 182380 |
| TURN | 220 | 220 | ALT | 11849 | 2072230 |
| PRMFP | NOM | | ΔAZ | | 2099910 |
| RUMPT | CLSE | CLSE | HDOT | 8 | 98 |
| | | | | -17812 | -1450 |
| TA-STATE | TRK-PASS | TRK-BFS | EAS | 1420 | 1420 |
| ΔX | -413388 | -5237461 | HOG | 1100 | 2150 |
| ΔY | 3944433 | 4856723 | NZ | | 6.920 |
| ΔZ | -731629 | -694886 | HOGERR | | |
| ΔDOT | 13829 | 13872 | QBARR | 800 | 780 |
| ΔVdot | -8675 | -6570 | ROLL | | -632 |
| ΔZdot | 5286 | 5394 | ROLLING | | -690 |
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| RAND | | | | | |
| RRP | | | | | 20.00 |
| RRP | | | | | 20.00 |

Mission Control 2/1/03 as communication with Columbia is lost on re-entry.

Photo - NASA

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The bottom line is that what you get out of a post-mortem depends on your attitude going in and the process by which you conduct it. In the final report regarding the Columbia Accident, it was noted that with both the Challenger and Columbia, problems were accepted without a full understanding of the risks associated with those problems. Some had mistaken being very lucky for being very good.

Post-Mortem Challenges

- Measuring Success
- Human Error
- Hindsight Bias
- Outcome Bias



*“What you see depends on
where you sit.”*

Col. Alan Scott (ret) First Air Force, regarding
the events as they unfolded on 9/11

So let's look at some of the challenges we face when doing a post-mortem. They involve how we measure success in the first place, how we define and account for human error, and the effect of biases. Col Alan Scott probably said it best when he said, “What you see depends on where you sit.” This is certainly the case as an event unfolds (whether 9/11 or a significant weather event), as well as in looking at an event after the fact.

Post-Mortem Challenges

Measuring Success

Which Office performed better?

| | Office A | Office B |
|--------------------------------|----------|----------|
| Probability of Detection (POD) | 80 | 70 |
| False Alarm Ratio (FAR) | 70 | 80 |
| Average Lead Time | 10 | 10 |
| Total Fatalities | 2 | 2 |

*

Let's look at how success may have been measured for these two hypothetical offices, A and B. The statistics are fairly close with Office A showing slightly better numbers. Based on these measures of success, which office did a better job? Which office would you rather be? Is there more information you would like to know before you decide this? If so, what are some of the questions you'd like to have answered?

Post-Mortem Challenges: Measuring Success: What Else is Relevant?



Here is a summary of responses from previous AWOC classes. Please take a moment to read through them before moving on.

Post-Mortem Challenges: Measuring Success: You Must Go Deeper

| | Office A | Office B |
|--------------------------------|----------|----------|
| Probability of Detection (POD) | 80 | 70 |
| False Alarm Ratio (FAR) | 70 | 80 |
| Average Lead Time | 10 | 10 |
| Total Fatalities | 2 | 2 |

In the eyes of the customer... Office B was a hero. Office A got nothing but grief. Why? There was more to the story than just these statistics (there usually is).

If you seek more information, you're on the right track. These performance numbers tell only part of the story. Other issues were involved.

Post-Mortem Challenges: Measuring Success: Is this Graph Misleading?



- What was F-scale of each?
- What was time of day?
- What was range of each?
 - How did radar(s) sample?
 - How well did other sensors sample?
- How well was event anticipated?
 - Were there environmental clues?
- How well did staff work together?
- What was experience level of staff?
- What was maximum expected lead time in "best case scenario"?
- Was the "best decision" made given the inputs and limits of science/technology?
- What was public response?

If we can't answer these questions, how do we know what to leave alone and what to fix?

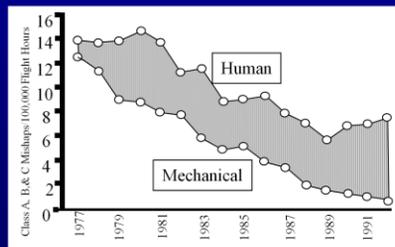
Here are just some of the details which might be useful when trying to decide what the performance was really like.

Answering these questions may help us know if the event was handled well or if there is room for improvement, and if so where? These and other questions you and your co-workers might have should be included in a routine part of a post-mortem.

Post-Mortems Challenges

The Human Aspect

- Human error has been implicated in 60-80% of incidents/accidents in complex systems.



Shappell & Wiegmann, 2000

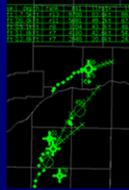
- Accidents attributable to mechanical factors have been greatly reduced, those attributable to human error continue to plague organizations.

Human error has been implicated in 60-80% of incidents and accidents in complex, high technology systems. These systems include aviation, nuclear power, oil, medical, rail, and marine transport industries. Weather forecasting also occurs in a complex environment. Although the overall rate of many industrial and transportation accidents has declined steadily during the past 20 years, reductions in human error-related accidents have not paralleled those related to mechanical and environmental factors. The tendency after seeing this is to think that humans are becoming more and more of the problem. Is that really what is happening? What are some other possible explanations?

Post-Mortems Challenges

Some Possible Explanations

- **Systems induce human error**
 - Don't account for human need to understand the state
- **“Fail safe” measures lead to higher risk behavior**
 - *the safety net has holes!*



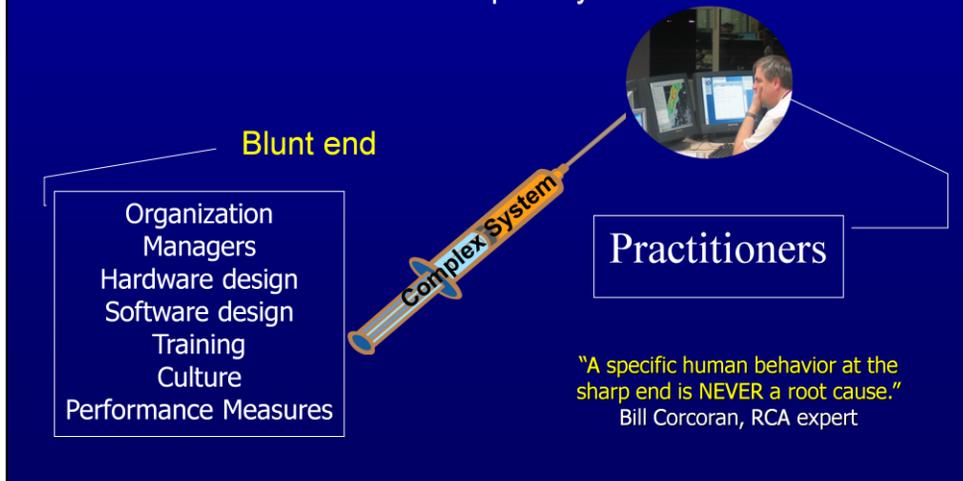
- **Not getting good feedback on human-system interactions**

In Shappell and Wiegmann's studies, it is revealed that as technology continues to expand in scope and coverage, the need to include the human user in the design is not always (or even often) considered. Technology which does not consider how a human operates, especially an expert, is not going to have good results when fielded. It is also a possibility that the person using the technology will have an overconfidence in its ability to perform a function. This may result from never having seen the technology "fail" (perhaps too few cases), or from not having much expertise in the area (must rely on technology as I don't know any better). Finally, it is likely that we are not getting routine feedback on the human-system interactions. That feedback is not only necessary during design, but after implementation.

Post-Mortems Challenges

What is Human Error?

Things attributed to human error occur at the “sharp” end of the complex system



There are lots of definitions of “human error” all of which seem to point to the action taking place at the “sharp end of the stick”. This is where the practitioner takes everything which has gone into the process up to this point and makes a yes/no, warn/no warn, shoot/don’t shoot etc., decision. While that may be the easiest thing to do, it is extremely simplistic and does not account for all the components present in a complex system. Bill Corcoran who studies events and their causes for a living, points out that the behavior of the human practitioner is not the start of everything, but rather the result.

Post-Mortems Challenges

The Danger of “Human Error”

- Attribution of human error after the fact is social judgment, not objective conclusion
- Studies show the use of the term is “prejudicial and unspecific”
- Restrains our understanding of how complex systems fail

Who did what wrong vs why did this decision seem right at the time.



(upon hearing that a twin engine plane had crashed into the World Trade Center),
“The President’s reaction was that the incident must have been caused by pilot error.”

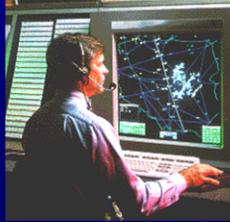
9/11 Commission Report Staff Statement #17

Far from being a compelling diagnosis, citing human error has often been used to direct blame. In reality, it is not an objective assessment and may actually keep an investigation from going any further. A “Heads will roll!” mentality. There is something in assigning “human error” which implies that nothing is really wrong, except the person making the decision.

Post-Mortems Challenges

Human Error Addressing the Problem

- View the human as the weakest link and automate them out of there,



*

Or...

- view “human error” as *a form of information about the system in which the human is embedded.*

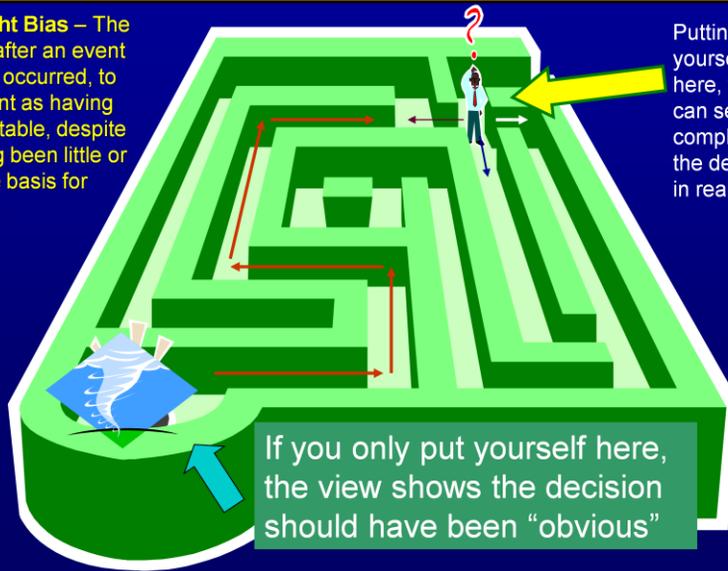


So, to address the problem, one can take a couple of stances. One solution is to decide the human is really the problem and ramp up the automation to replace them. This might have one set of implications when the task is wrapping bon-bons in candy wrappers, but an entirely different implication when the human in the loop is there to add expertise and employ critical thinking skills. In the latter environment, a better solution is to investigate how the human interacts with the automation and view “errors” as a form of information about that interaction.

Post-Mortems Challenges

Hindsight Bias

❏ Hindsight Bias – The inclination, after an event has already occurred, to see the event as having been predictable, despite there having been little or no objective basis for predicting it.



Putting yourself here, you can see the complexity of the decision in real-time

If you only put yourself here, the view shows the decision should have been “obvious”

What are some other dangers when doing post-mortems? Have you ever seen a bad outcome and wonder “just what was the guy thinking?” or thought “Anybody should have been able to see that!” Well that may be how you feel, and it may even be true, but apparently it didn’t happen in this case and the question is “why”?

To really understand how we got from point A to point B, it is important to leave behind what you know happened, and put yourself in the position of the decision maker and see what they saw *at that time*. This helps avoid the “hindsight bias” which is the inclination, after an event has already occurred, to see the event as having been predictable, despite there having been little or no objective basis for predicting it. We see lots of issues regarding this in the 9/11 discussions.

Look at the options which were available to the decision maker at the time and see how they got to where they went. That’s where the real understanding of the process and the potential solutions lie. If you only set yourself at the end of the event and look backwards, you won’t have the same view. The best way to work a maze is by starting at the end and going back to the beginning...there is only one way to go and it is obvious. But that tells you nothing about how it was possible for the

events to unfold as they did.

Post-Mortems Challenges

Outcome Bias

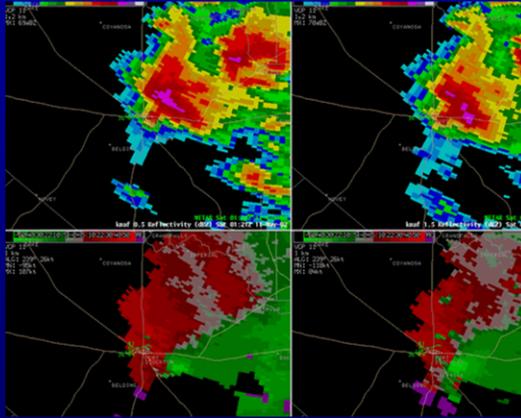
Outcome Bias – An error made in evaluating the quality of a decision when the outcome of that decision is already known.

A good decision process does not always lead to a “good” outcome

Action: *tornado warning*
Result: *nothing happened*
(good? bad?)

A flawed decision process does not always lead to a “bad” outcome

Action: *no warning at all*
Result: *nothing reported*
(good? bad?)



Another bias to be aware of is the “outcome bias” which is an error made in evaluating the quality of a decision when the outcome of that decision is already known. Good outcome...must have been good process. Bad outcome...must have been bad process. Not necessarily.

In the first example, a tornado warning was issued and no verification was received. Was it a good or bad decision process based on what you see here? Although verification stats show a check in the False Alarm Ratio (FAR) column, do you feel the warning was justified? Strong rotation at more than one elevation slice with an inflow notch and pendant suggest tornado potential. Maybe no one was there to report it or maybe it just didn't happen. Knowing the limitations of the science and technology as well the need for adequate lead time, perhaps this was the best decision.

In the second example, no warning was issued and nothing was reported. Was it a good or bad decision process based on what you see here? True it went down in the books as a good non-warning decision, but that could have been attributable to other things, not to mention one of which was nobody to report it. While you could argue the tornado potential with this storm, there are indications that severe hail is

occurring.

Getting past the outcome bias

How About Evaluating the Process?

A good decision-making process accounts for:

- the current state of the science
- strengths and limitations of the technology
- human factors

Uncertainties in all areas means outcomes will not always be perfect

“Irreducible uncertainty is accompanied by inevitable error which results in unavoidable injustice.”

Kenneth Hammond

So it is important to do the best we can with what we have and what we understand. Ultimately when assessing the process, you want it to be sound and based in a good understanding of the science and technology with consideration to the context of the event itself including the public you serve. You'd want the action repeatable. The process is in our control, but the outcome is not. Dr. Hammond captures the dilemma when he discusses the effects of irreducible uncertainty. At any moment in time there is some degree of uncertainty and if you are not able to reduce it by adding data or adding understanding, you must make decisions based on the information available at the time, imperfect as it can be.

Overcoming Biases

To Affect Outcomes, Evaluate the Process

Ask,

- “What would you do next time given the same set of circumstances?”
- “What would your co-workers do?”
- “What would an expert do?”



– If the answer is “the same thing”, solution probably doesn’t lie with the decision process.

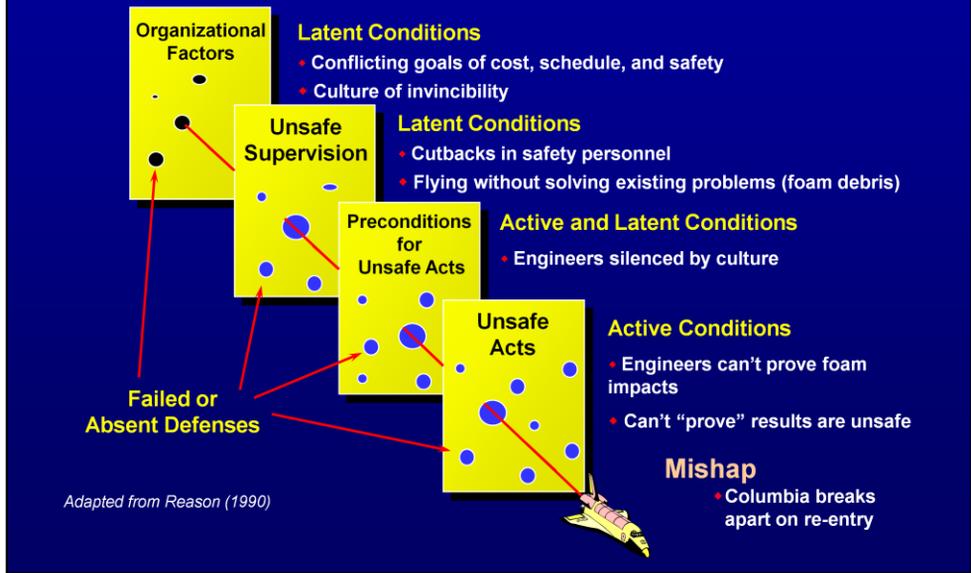
– If the answer is “something different”, investigate the reasoning for alternate courses of action.

*

One set of questions you might ask of yourself after an event is whether or not you would do the same thing next time? Maybe ask some co-workers or someone you’d consider an expert. If all agree, then you probably have a good process and the issues may have resided in the uncertainties of the data sets or technology we have. Or it could have been a conscious decision to err on the side of caution due to an unacceptable risk you perceived for those in the path. If others might have done something else, look at their reasoning and discuss. Maybe you haven’t thought of all aspects, or maybe they haven’t thought of yours. Regardless, it’s an opportunity to grow in knowledge and advance your critical thinking skills.

Overcoming Biases

Some Contributing Factors Exist for Years

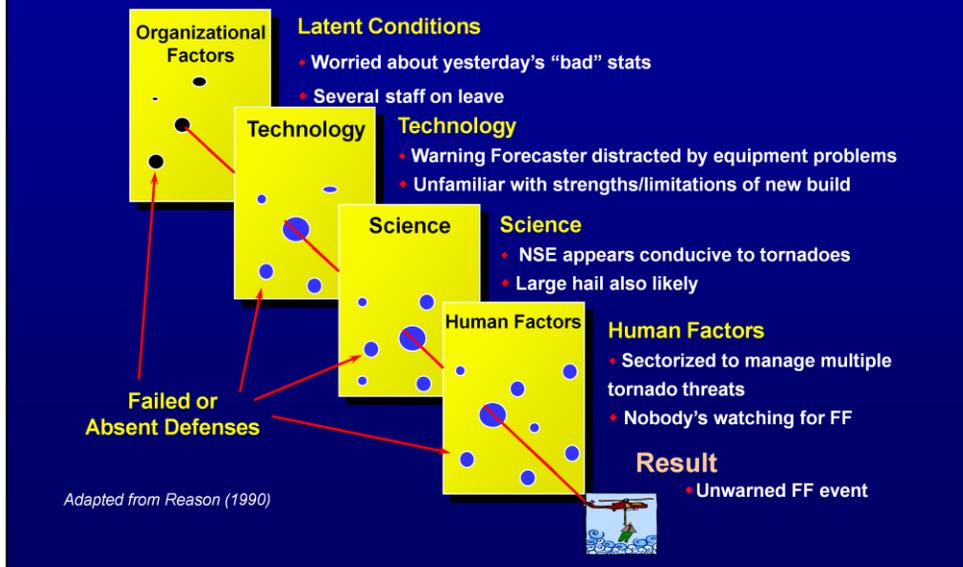


Another example can be gleaned from the final report on the Columbia shuttle mishap. This takes into account the “latent” conditions which are in place at the time of the incident.

Latent conditions can go unaddressed for long periods of time for numerous reasons, but one of the more common is the effort it takes to resolve, especially if nothing “bad” has resulted so far. Numerous latent conditions, many still in place after the Challenger investigation, were cited as contributors to the Columbia accident. Ultimately you want to identify these “holes” or absent defenses and plug them up before they contribute to a larger disaster.

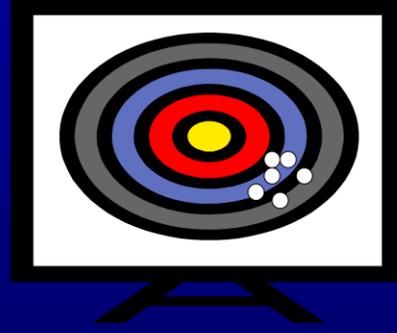
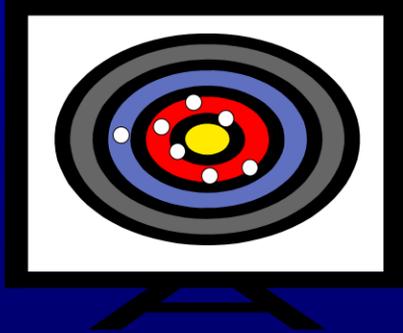
Overcoming Biases

In a Warning Environment



How about NWS warning operations? There may be organizational issues in place either nationally or locally every day which are not in and of themselves bad. However when put with other contributors, they can facilitate a bad outcome. In this example, the "slices of swiss cheese" are organizational factors, technology, science, and human factors with the "holes" in each representing factors or in some cases contributors to the outcome.

A Post-Mortem Database Can Tell Us Many Things



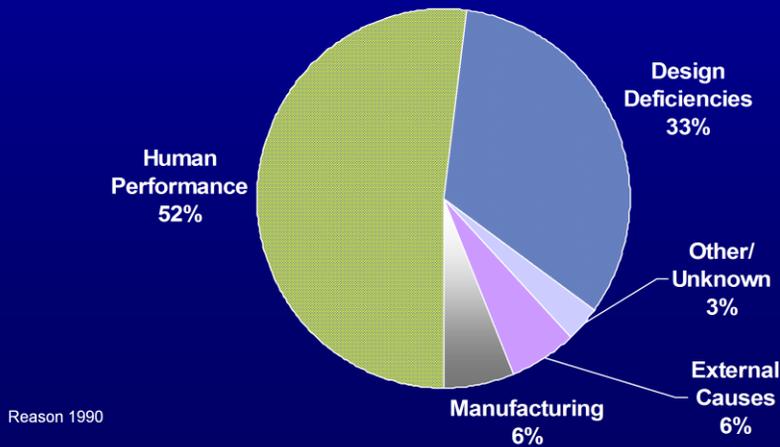
- When we miss the target, is the reason varied, or are we continually missing in the same direction?
 - Find relationships
 - Identify trends

Reason 1990

Next we want to look at another motivation for doing post-mortems which is producing a database. When we no longer have just a few in depth assessments, but rather a large population of events, much can be revealed. We can see if most contributors to bad outcomes all fall in the same area, or if they vary by office or region or time of year. We can compare meaningful statistics over time to see if more or less outcomes are being affected by technology-based contributors, or if workload for instance, is becoming more and more of a factor. We can answer those questions about sampling issues or time of day and see if there is a relationship between these occurrences and our ability to get lead time.

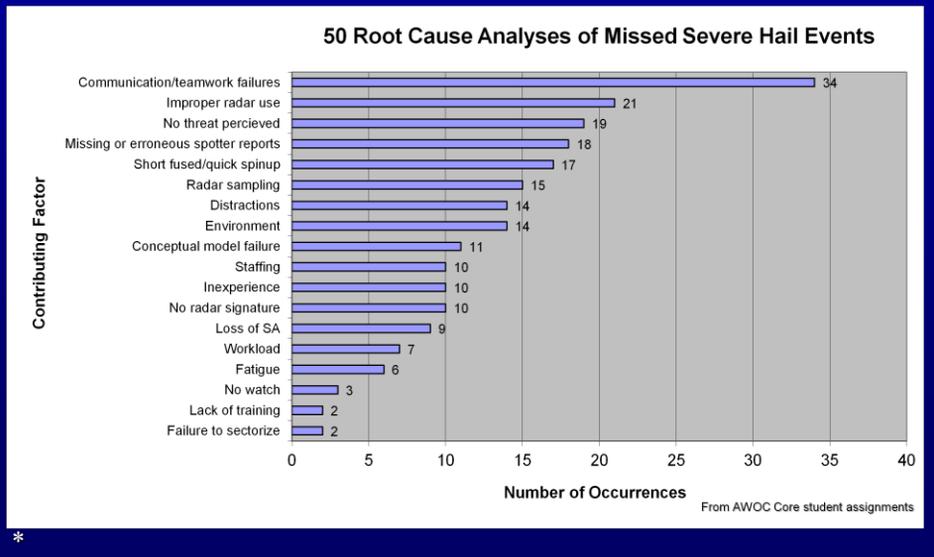
Post-Mortem Database Insight

Analysis of 87 significant events (182 identified root causes)
reported to Institute of Nuclear Power Plant Operations in 1983.



Here is an example of a database of Nuclear Power Plant operations in 1983. By having a database, it was readily apparent what categories were showing up in what numbers. Human performance (and hopefully we now have a better understanding what we mean by that) was the leading category. Design deficiencies followed that. This can be helpful (after digging a little deeper of course) when trying to adjust problem solving resources.

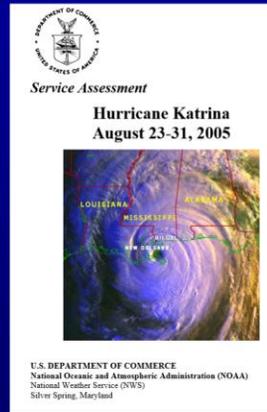
Post-Mortem Database NWS Example



An example closer to home shows how we can use a NWS database to see what factors have contributed to certain events. In this example, 50 root cause analyses (RCAs) of missed severe hail events reveals numerous contributing factors. Note that communication and teamwork failures was a contributor 34 times.

Post-Mortems Types in the NWS

- **National**
 - Service Assessment
- **Regional**
 - Significant Event Report
 - For the Record (FTR)
 - Other
- **Local**
 - Varies

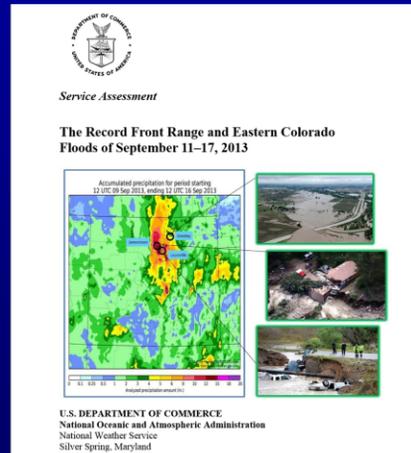


The National Weather Service produces various types of post-mortems. A Service Assessment is done for nationally significant events that meet certain criteria. At the regional level, Significant Event Report, For the Record (FTR), and others are used. While at the local level, post mortem types vary considerably; some are very detailed and performed regularly, while others are brief and just occasional.

Post-Mortems

NWS Types: Service Assessment

- May be triggered by:
 - Major economic impact on a large area or population
 - Multiple fatalities or numerous serious injuries
 - Extensive national public interest or media coverage
 - Unusual level of attention to NWS performance
- Assessment teams determine the usefulness of NWS products and services.
 - Generate a report which identifies best practices and service deficiencies



NWS conducts Service Assessments to evaluate its performance after significant hydrometeorological, oceanographic, or geological events. Assessments may be initiated when one or more of the following criteria are met: Major economic impact on a large area or population, multiple fatalities or numerous serious injuries, extensive national public interest or media coverage, and unusual level of attention to NWS performance

Assessment teams, composed of experts from within and outside the NWS, evaluate activities before, during, and after events to determine the usefulness of NWS products and services. The team generates a report, which serves as an evaluative tool to identify and share best practices in operations and procedures, and identify and address service deficiencies. The goal of the activity is for the NWS to continuously improve its services to the nation.

Summary

- The value of a post-mortem
- How to prevent an ineffective post-mortem
- Post-mortem challenges
- Post-mortem database
- Post-mortem types in the NWS



Let's now summarize this lesson on "Learning from Post-Mortems."

A post-mortem is valuable because it can: Help people develop and maintain expertise, include many perspectives, assist all levels of an organization, pinpoint what's wrong, and leave alone what's right.

To prevent an ineffective post-mortem, we must avoid categorical thinking and a favorite solution. We must maintain a positive attitude and conduct.

A post-mortem team can encounter many challenges. We discussed how statistics alone may not tell the whole story and that we must dig deeper. We discussed the danger of blaming everything on "human error," especially in an environment where a human is necessary to add expertise and employ critical thinking skills. We discussed the pitfalls of hindsight bias and outcome bias.

We learned that a post-mortem database can tell us many things. We can find relationships and identify trends.

We finished with a discussion of post-mortem types used in the National Weather Service including the Service Assessment.



Quiz - 6 questions

Last Modified: Apr 09, 2015 at 04:40 PM

PROPERTIES

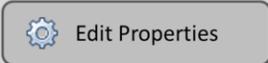
On passing, 'Finish' button: [Goes to Next Slide](#)

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If you have questions, contact your AWOC facilitator (most often your SOO). You may also contact us via the AWOC Core e-mail list shown here.

References

Aviation Safety Reporting System, <http://asrs.arc.nasa.gov/>

Galley, Mark (2011) CauseMapping. Thinkreliability.com

Gano, Dean L. (1999) *Apollo Root Cause Analysis*. Yakima Wa: Apollonian Publications

Hammond, Kenneth (1996) *Human Judgment and Social Policy*. New York: Oxford University Press.

Reason, J. (1990) *Human Error*. New York: Cambridge University Press.

Root Cause Live, <http://www.rootcauselive.com/>

Shappell, S., D. Wiegmann. (2000a). The Human factors Analysis and Classification System (HFACS). (Report Number DOT/FAA/AM-00/7). Washington DC: Federal Aviation Administration.

Shappell, S., D. Wiegmann. A Human Factors Approach to Accident Analysis and Prevention, Workshop, 45th Conference on Human Factors and Ergonomics Society, Minneapolis, 2001

Wood, David D., Johannesen, L., Cook, R., Sarter, N., *Behind Human Error: Cognitive Systems, Computers and Hindsight* (SOAR December 1994, from the Crew Systems Ergonomics Information Analysis Center). Wright-Patterson AFB, Columbus OH.

Here are some of the references used to create this lesson.