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Accidents, accident guides, stories and the truth

Ted Putnam, PhD

Mindful Solutions, 3431 Flicker LN, Missoula, MT 59804, tputnam@bresnan.net

Abstract: Here at the 11th Wildland Fire Safety Summit we are students of fire safety, which is our basic reason for gathering to exchange our collective and separate visions. The secondary theme is how stories and narratives aid in this process. Historically accident investigations have provided crucial feedback for maximizing safety. These investigations have usually produced step-by-step factual reports to document the accident. Recently some investigations have recommended relating the accident in a story format to increase readability, interest and learning within firefighter safety cultures. Generally the goal of accident reports is to convey as much of the truth of an event that is discoverable. However time, money, skill level, skill variety, accident guide used and other related factors can either enhance or deter the depth of understanding the accident causal elements. Sometimes investigators deliberately distort or do not report all the causal elements. Such biases lead firefighters to distrust the resulting reports, which can hamper our efforts to stay safe.

Additional Keywords: Accident guides, true stories, accident causal factors, mental errors, HROs and accident cover-ups. Historical fire examples: Mann Gulch, South Canyon, Alabaugh Canyon, and the Crandall Ranger Station Chainsaw Accident

Accidents, accident guides, stories, and the Truth

What follows is an exploration of USA wildland fire accidents, accident guides, stories and the truth. These issues are further detailed to learn how they can produce excellent products, or deteriorate into partial truths and sometime lies. Historical fires are cited to demonstrate the actual processes and reporting involved. Central to this analysis is the need to consider how our own minds tell us stories and make errors, which in turn affect our actions and outcomes. With mindfulness training we can learn the skill of non-attachment, stress reduction and to be mindful in our present environments. Thus reduction of mental errors is a learnable skill. Since the human mind and mental events are common to all people, cultures and organizations the relevancy of cited concerns extends beyond wildland firefighting to safety in other contexts.

Professional qualifications

Since I will often express my opinions about topics in this presentation, it is relevant to present my professional qualifications. In 1977 I received a PhD from the University of Montana in Experimental Psychology with a learning major and mathematics minor. My master's thesis and doctoral dissertation involved operant conditioning experiments, thus expertise in behaviorism based on rewards, punishments, rules and regulations. Later I began to study Eastern Psychology because it focuses on mental processes and what you can do through meditation to improve your own mental awareness, processes and decision-making. Part of this training has involved four years of supervised study of mindfulness meditation to enhance mental processes. My experience base now offers a blend of Eastern and Western psychology.

My fire accident investigation career began in 1976 with the Battlement Creek Fire and my last accident investigation was the Crandall Ranger Station Tree Felling Accident in 2010; a span of thirty-five years. Prior to my accident investigation experiences I spent 14 seasons fighting wildland fires beginning in 1963. Three years were on Forest Service district fire crews. The next eleven years were with the Missoula, Montana Smokejumpers; the last three years as a supervisor. From 1976 to 1998 I was an Equipment Specialist at the Missoula Technology and Development Center, a detached Washington Office unit located in Missoula. My area of technical expertise was fire and safety equipment; in particular fire clothing and shelters. Part of my job was analyzing how the clothing and shelters performed under actual entrapment conditions and what firefighters could do to avoid entrapments in the first place. I have been involved in the fire arena for roughly forty-eight years.

In the 1980s I began reading and studying wildland fire, other federal Agencies, military and private accident investigation guides. At that time I used the guides and they seemed to account for accident causal elements. Later I began to question those authors and guides because they were mostly externally, physically, rule orientated as opposed to internally, subjective, mental decision orientated. Because such "two quadrant" guides were the best available at the time, the wildland agencies used them as models. Today these same guides have shifted to more emphasis on the cultural causal elements but still fail to seriously consider mental elements. When mentioning mental elements they acknowledge there is something to seeing events as the involved people saw them, but they have few ideas and processes for doing so. By the time I had investigated the Dude Fire in 1990 I no longer put much credibility in these guides unless the accident involved specific physical concerns such as vehicles or the movement of supplies and firefighters (physical organizational problems). None of the models work for dynamic interactions seen in wildland firefighting. When analyzing the South Canyon Fire fatality causal elements I felt as a team we reported at best half of the known fatality causes. When attempting to get several obvious causes into the report the team leaders refused to consider them, not because they weren't potent causes, but because they were not "within the scope of the investigation". Their reasons protected agency images and processes that they were unwilling to consider. This is why I feel the South Canyon was and remains a cover-up. No other members of the South Canyon team would support mental, cultural or organizational causes (per existing guidelines); if it wasn't a physical cause, then it was deemed unimportant. Thus there are often political agendas determining which of the causal factors are acceptable and reported. My analyses often stress individual mental practices and cultural pressures to compliment and soften the endless rules deemed necessary to control firefighter actions.

Accident Investigation Concerns

Although it seems obvious that accident investigations should strive to uncover the actual causes and conditions that led to the accident, this is seldom attempted let alone advocated in the relevant agency investigation guides used by wildland fire and other organizational (Airlines, NASA, Military, etc.) accident investigators. Failure to look for all discoverable causes and conditions leads to accident reports that are superficial in understanding or missing vital information on what really occurred as well as why it occurred. It is relevant for individuals and organizations to look at what accident guides investigations are focusing on compared to what they could and ought to be focusing on. Specifically, we ignore the impact of the individual's cognitive processing on accident causation.

All phenomena arise in dependency on causes and conditions. Furthermore causes and conditions are constantly changing. Most of our actions are automatic or habitual in nature and occur so rapidly that discrete actions go unnoticed. Most human behavior arises due to unconscious causes and conditions and as such we struggle to know why we do what we do, let alone why others do what they do. To understand our own mind is to understand the minds of others due to common underlying processes. Trying to make sense of and report accidents are both mental fabrications, which arise yet because of other causes and conditions. It is well known that our minds can automatically delete old or add new memories to events such as accidents. This means the sooner you can collect witness statements, the more accurate they are likely to be. Thus all reporting is problematical.

A good accident guide is analogous to a good experimental design. In a well-designed experiment, the experimental design is paramount for what data to collect, how to collect the data and predetermines to a large degree the type of conclusions that can be logically drawn from the experiment; similar concerns apply for accident data collection and conclusions. Although wildland agency accident investigation guides are analogous to experimental designs, few administrators, guide creators or users have any depth of understanding the accident guide limitations, let alone their own limitations, as they investigate. The guides do not correspond to normal reality and investigators are usually untrained in both the guides and conducting investigations. Thus muddling through is the status quo with far reaching consequences.
Few people conduct good investigations because they do not question the assumptions that each guide makes about reality and our access to it. Psychologist and philosopher Ken Wilber (1997) has written extensively about reality and has a model for helping us understand this. Wilber describes an elegant framework for both understanding and creating changes in individuals, cultures and organizations. Specifically, Wilbur argues that for complex changes and clear understanding to take place we must explore and take action in “all four quadrants”: intentional, behavioral, cultural, and organizational. If we change a Wilber figure on the four quadrants by modifying it for firefighting it would look something similar to the following:

THE FOUR QUADRANTS OF REALITY

INTERIOR, INDIVIDUAL	**EXTERIOR, INDIVIDUAL**
INTENTIONAL	***BEHAVIOURAL***
Awareness Consciousness Mental Elements Thinking Human Error Mindfulness Resiliency Meditation	Body Brain Neural Nets Blood Cells Physical Physiological
I	**IT**
INTERIOR, COLLECTIVE	**EXTERIOR, COLLECTIVE**
WE	**IT**

CULTURAL	*ORGANIZATIONAL*
Mutual Understanding	Firefighters & Crews
Common context	Fire behavior & Environment
Communications	Fire Orgs. : NIFC, NWCG, HROs
Leadership Principals	10 & 18: Rules, Rewards, Punishment
Morals and Ethics	Locations
Cohesiveness	Function: What does it do?
Relationships	Wildland Fire Safety Awareness Study
Crew Risk Taking	Movement of Firefighters and Supplies

Within this context up until 1995 the wildland fire organizations focused mostly on the exterior, physical IT quadrants because they were more scientific and physically orientated and neglected the more subjective, interior I and the WE quadrants which were less understood by firefighters and our society in general. Considerable work has been done and results implemented for cultural concerns following recommendations stemming from the South Canyon Fire in which fourteen firefighters died. The two key initiatives were the 1995 Human Factors Workshop (USDA, 1995) and the *Wildland Fire Safety Awareness Study* (TriData, 1998). However the "I" quadrant is still largely unexplored by the fire community and accident investigation guides. We ignore mental causal factors in our cultures and organizations precisely because we have been ignoring our own mental processes as individuals our entire lives. We know how to use our minds but know little about the underlying processes. Without a meditation practice most people confuse mental content with mental processes. This paper brings more focus to the "I" quadrant, by exploring the mind, *in and of itself*. The qualifying phrase "in and of itself" means without regards to anything except the mental processes as directly observed in our own mind. Specifically it does not refer to the content of the mind such as words, ideas, images, beliefs, thoughts, reasons, etc. We need to understand both content and processes since knowing the difference will help firefighters stay more mentally alert and make better decisions especially under highly stressful, risky conditions. For example stressors are additive and interfere with long term memory such as rules and safety precautions. Meditation exercises directly reduce stresses and enhance mental processes keeping firefighters more alert to make better decisions.

Wildland fire organizations typically focus on exterior quadrants and neglect to investigate how interior quadrants contribute to accidents. If we ignore quadrants, we fail to recognize how they contribute to confusion between the different types of accounts gathered in accident investigations. Ignoring quadrants shifts accident investigations results along the following continuum: away from the Truth to a True Story to a Story or worse, in cases of deliberate deception, to a Lie.

Truth can only be known in the present moment. The truth or reality, which occurred in the past, is non-recoverable since we and those involved in the accident cannot go back and replay the conditions and events. In our society we use the word Truth generally to imply speaking morally and ethically. When witnesses comment on what occurred, what they tell us are memories, which are mental constructions or stories about the event containing only partial bits of the original truth. Therefore it takes more effort to produce a **True Story** (or **factual account)** that closely approximates the truth (we can never fully capture the past in any account, no matter how complete or accurate it is, but some accounts come closer). A True Story necessitates that investigators and witnesses are skillful in their attempts to recover whatever evidence is available

for discovery. When some parts of the accident reconstruction do not make sense it is helpful to invite experts in to help fill in the gaps. A fire behavior expert can better reconstruct the movement of the fire; a sociologist the contribution of crew risk taking; and a psychologist for reconstructing likely patterns of mental errors that affected personal risks, beliefs and decision making. Since these experts are producing skillful probability accounts they are also fabrications and thus **Stories** about the accident. Stories can be **misleading accounts** (when a person lacks important information but weaves together an account; usually contains errors that can be verified with fact checking). When information is deliberately falsified or withheld, **Lies** occur. Lies are **deceptive accounts** (intentionally meant to manipulate information) and make it difficult to fully understand the causes and conditions and once suspected they undermine the credibility of the investigators, accident report, accident guide and organization. The four quadrant concerns help focus attention on the elements involved in discovering causes and conditions not only for accidents but for all that we do personally, socially and organizationally.
A warning is also appropriate: to use the methodologies of one quadrant in another quadrant invites distortions and misinterpretations, an example of which is when scientific techniques are used within the intentional quadrant and to a lesser degree in the cultural quadrant. See Wilber's (1997) writings for further implications of failing to make changes in all four quadrants within a common time frame. Fire personnel and organizations operate in the behavioral and organizations quadrants where they have considerable expertise. They have less expertise in the cultural and intentional areas where experts outside the fire organizations can offer additional insights. After considering how to discover reality in various situations we can now explore how the wildland fire agencies seek to discover what goes amiss in accidents and near misses.

General Accident Guide Considerations

The Organizational Learning "Lessons Learned" Analysis Options (OLO) (2010) Forest Service guide provides some of the reasoning behind choosing their different accident investigation guides. **Administrative Investigations** are required if there is evidence of intentional recklessness, dishonesty, or substance abuse; **or** employees are not willing to talk openly and share results. A **Serious Accident Investigation** (SAI) using the Accident Investigation Guide (AIG) and is advised when: a fatality occurs, a serious permanent medical disability is likely, litigation against an employee is a serious concern or a well-intended employee would **not** have made the same mistake. Author's Note: This last concern is essentially a judgment to blame or not, and determines whether a SAI or an APA is appropriate. Thus traces of blame taint both guides. An **Accident Prevention Analysis** (APA) is advised when: employees are willing to talk openly and share results ***and*** the event indicates a possible organizational failure, a systemic cultural concern, a training program deficiency, or a doctrinal inadequacy; ***or*** Exposing the event and the conditions that enabled the accident could provide the larger organization with a powerful or unique learning opportunity.

With respect to the four quadrants the SAI primarily functions in the two exterior quadrants and the APA within the two collective quadrants. Both guides basically ignore the intentional quadrant. Thus the SAI and APA show a significant lack of understanding human error as a mental process. Human error is an almost constant by-product of the human mind in everyday use and as such it will not be lessened to any significant extent by studying cultural and

organizational conditions, which is why it is called human error as opposed to cultural or organizational error.

If the OLO continues to maintain such biases, it should clearly state that the SAI and APA guides do not attempt to identify mental causes and conditions of accidents. To date the way wildland fire agencies conduct accident and fatality investigations are ironically inconsistent with their own organizational premises, one being that safety is a primary concern. The OLO seems to be suggesting what goes on in firefighters minds isn't of much importance since firefighters are under the control of cultural and organizational rules and regulations. What would be the best format for conducting accident investigations at all levels? It would be something akin to the Four Quadrant Analysis (4QA) in Appendix A. The 4QA model combines all four quadrants into a suggested outline for and full reality based accident investigation guide. Some of the reasons for implementing 4QA guide are based upon flaws routinely encounter in the practical applications of the SAI and APA guides.

Historically wildland fire entrapment investigations have operated with strong biases and typically left out entire quadrants of analysis, i.e. the cultural and intentional quadrants. Often these actions involve **deceptive accounts** but sometimes they involve **misleading accounts**. Why do people and agencies do this? Below are some of the reasons based on my personal observations:

Reasons for deceptive accounts include:

- Other organizations do it (such as structural and wild fire agencies, the Military, NASA, etc.).
- The agency will be sued if we don't
- Key individuals have suffered enough
- The Agency will look bad.
- We'll correct the situation when "the ashes have settled," but it seems the ashes never settle.
- Using political agendas to falsify or withheld accident causes
- Sending unskilled employees who aren't likely to find much to report

Reasons for misleading accounts include:

- Sending good, yet untrained people to investigate
- Seldom asking for highly trained investigators even when they have the relevant, necessary skills such as psychological, sociological and organizational experts
- Sending interested parties as investigators with known biases
- Sending only people with only firefighting expertise, as that is primarily what they will notice and report
- Removing witnesses and evidence before the team arrives
- Failing to preserve the accident scene
- Ineffective interviewing skills that lead to short, incomplete accounts, i.e., lack of sufficient detail to understand underlying human factor causes.
- Analyzing the accident using a set of rules (the 10 and 18) that is guaranteed to show firefighters did not follow them and then report superficially that firefighters failed to obey or follow them with a subsequent perennial easy fix: "Back to the Basics" of following the 10 and 18

- Quick turn-around, low cost investigations: If it's not reported, you don't have to fix it and can't be held responsible later for similar future occurrences including fatalities.

In the above list the people you send to an accident investigation differ greatly in their specific areas of expertise, if the expertise is relevant, and then generally find only what they already know. So in that sense you predetermine the accident causes by the investigators you choose. No sociologist implies no detailed looking for deeper cultural causes. You also predetermine the causes by the accident guide you choose i.e. AAR, FLA, APA or SAI. AAR's are usually conducted at the crew level so will reflect the crew's beliefs and experience levels. The FLA brings in people to facilitate the learning process thus some outside views. But how far do you go to find the reviewers? Are they still within a larger local organization such as a district or forest? The further you go from home the more the costs go up but the more likely you are to get a fresh look at your current practices. Serious non-fatal accidents suggest using the APA guide. The APA guide is based on looking primarily at latent cultural and organizational causes of accidents and leaves out the Intentional Quadrant. In my opinion this limits the causal elements to exploring no more than 50 percent of the possible causal factors.

Fatal accidents require using the SAI. The main difference between the APA and SAI is that the SAI considers punishing involved individuals from the start, *even when those individuals acted to the best of their ability at the time of the accident.* The SAI is the most scientific of the four OLO guides so the best model for physical causes of accidents. It is also a behavioristic model so recommendations take the form of new rules, regulations, rewards and punishments. It is the least effective guide if latent mental errors are the primary causes of the accidents, which is usually the case in wildland fire burnovers. Since science has no methods for looking at subjective mental elements, then mental errors, in effect, do not exist so no subjective lessons are learned. Thus individuals involved are typically punished because the false assumption is they intentionally cause the negative events by not following the endless rules. Both the SAI and APA guides ignore the potent effects of mental stressors, common in wildland firefighting, which make it very difficult to remember rules such as Fire Orders or the Eighteen Watchout Situations at the precise time they are most needed. Said another way mental skills bottom out in the late afternoon at the time when fire behavior becomes the most active or extreme.

Both the SAI and the APA show little understanding of mental processes. Out of this fundamental ignorance they tacitly imply that people always act intentionally (SAI) thus blaming firefighters is considered; or that firefighters mindlessly follow rules (APA) and therefore focus on changing cultural and organizational rules to control firefighter behaviors. Neither guide has procedures for uncovering or understanding mental processes or what to do with the information if it were collected. Both ignore that there are logical consequences of choosing one experimental design (guide) over another and that choice in turn limits results and interpretations. This fundamental ignorance arises due to expert firefighters and managers leaving their quadrants of understanding and venturing into quadrants where they have little expertise when they conduct investigations.

They are led astray because the guides they follow for fire accident investigations have already made the same errors. Perhaps those who write accident guides, like modern psychologists, are holding observations so strictly to scientific, objectively external behaviors that they fail to note the limits of scientific method and its inability to explore the Intentional Quadrant. Their tacit conclusion is that if the event can't be studied scientifically, it must not exist. They ignore the real Truth that rational logical people have been successfully exploring the

Intentional Quadrant for thousands of years before the Scientific method existed and that Science itself is dependent on methods derived from the very quadrant it tries to ignore. Science itself has profound uses but comes with its own limitations; limitations ignored by most users.

Consider the roots of the two accident guides for serious fatal and non-fatal accidents: the SAI and APA respectively. The SAI arose from accident models that involved airplanes, vehicles and boats. The APA arose from a hospital medical model. These models view Human Factors (HFs) as interfaces between people and machines in a mechanistic physical world. Neither model really spends much time or effort looking at how our minds influence what we do. Human behavior is seen simply as S→R meaning an environmental stimulus propels us into taking a discrete action. A more advanced version is the S→ Black Box →R model. That is to say it is the Stimulus (S) (conditions, rewards, punishments, rules and regulations) in the external environments that control Responses (R) or actions. You need not explore or consider subjective mental environments of individual human minds; which are the mental "Black Box". This is the classic behaviorism paradigm which deals primarily with observable behaviors based on controlling external rewards and punishments. Behaviorism is assumed in both the SAI and APA. What is missed in these models is that Rs or Responses are usually also Discriminative Stimuli (SDs) for triggering the next behavior in a much longer response chain. Thus a resulting R is the proximal cause for the next response. That should remind us that an error can be both a result and a cause, contrary to the simplistic thinking behind the SAI and APA.

Behaviorism is a reasonable methodology for exploring the objective quadrants but falls short in the subjective quadrants. The four quadrants are themselves a conceptual model created to remind us of flaws inherent in using two quadrant accident guides as we attempt to better understand the reality we exist in. Although we talk about separate quadrants they are so intimately connected that they rise and fall together as one entity. A fundamental truth is that there are no separate Behavioral, Organizational, or Cultural properties in existence that don't have their basis in the Intentional Quadrant. To fully understand one quadrant is to fully understand them all. To ignore one quadrant is to ignore them all.

Most accident guides ignore the Intentional quadrant. It is more difficult to understand your or other people's minds because there are very few courses in public educational or military training systems and none in fire training systems that promote understanding internal mental processes. When we ignore our own mental processes this guarantees that we are also ignoring the related correlates in the other quadrants. Because we, as individuals, are constantly producing mental errors we are also constantly distorting reality with respect to physical, cultural and organization entities as well. When we have mental distortions then everything we relate to is also clouded or tainted. We cannot ever really understand why accidents occur or how to promote safety without better understanding our own mental processes. Meditation is the fundamental way, the sine qua non for understanding mental processes. Do you meditate? Most of us would answer no, so the SAI and APA biases are not surprising at all. However that ignorance translates into a rough doubling of fatalities, accidents, injuries and close calls and thus should no longer be tolerated personally or by agency risk managers and administrators.

In the past fifteen years or so, wildland agencies have begun promoting High Reliability Organizations (HROs) tenets to a greater extent. The APA in particular says it models itself after such tenets. HROs are conceptual thus fabricated organizations that cannot exist unless their operational processes first exist in people's minds. We hear a lot about learning from errors to

become more resilient. When considering resiliency, there are no resilient organizations unless there are resilient minds in those organizations. Yet HRO training for resiliency stresses properties of resilient organizations (Behavioral and Organizational processes) and rarely considers how to train your own mind to become more resilient (Intentional Quadrant). Mindfulness meditation is the optimal practice to maximize resiliency but seldom mentioned with respect to HROs. When mindfulness is mentioned in the West it usually refers more to awareness and attention as behavioristic concepts in comparison to the East where it is an elemental mental skill fostered through meditation practice (Weick and Putnam, 2006). To me there are no mindful HRO's unless they promote mindfulness meditation for their employees and are populated by mindful employees (in the Eastern sense of mindfulness). *Our accident guides ignore mental processes precisely because we are in the habit of ignoring mental processes as individuals, cultures and organizations.*

SAI Guide Specifics

The SAI is an older and more accepted type of accident guide. The SAI guide can be thought of as a classic scientific, physical, and behavioristic causal model. It does a much better job of looking at casual factors related to aircraft or vehicle accidents or on wildland fire accidents with respect to weather, fuels, and fire behavior. The SAI mostly stays in the two exterior quadrants. The SAI tells us what happened but seldom why it happened. The strength of the SAI is in data collection, when done properly. Properly here means to ask in-depth relevant questions, record it electronically and have printed out statements for witness signatures. In the SAI investigations I have been involved in firefighters have been willing to be truthful but clarify that they also want other firefighters, managers and supervisors to do the same, so responsibility exists on a level playing field. The data once collected **properly** becomes a gold mine of information. If the data is publically available, then even years later, readers and researchers may discover connections missed by the original investigation team. Such data also allows trend analyses to look for causal factors and assess the strength of those factors over years of data collection. The negative aspect of SAI is that proper interviews and data collection are not the norm and the data once collected is often hidden supposedly to protect firefighters; but more likely to protect the Agency and accident team personnel for failing to get right the first time. Hiding interviews and data are the biggest ways Agencies routinely cover-up accident causal factors or what they failed to do. Until there is transparency our Lesson Learned Center has too many inaccurate accounts of fire accidents. At the Lesson Learned Center there is also a noticeable lack of articles based on mental elements and training for better understanding of firefighter realities.

When dealing with firefighter's actions the SAI model considers rules, rewards, punishments and doctrines as orders for what firefighters should do. From SAI premises, accidents occur when rules aren't followed so rule breakers should be punished. The most visible rules are Lookouts, Communications, Escape Routes and Safety Zones (LCES), the 10 Standard Fire Orders and the 18 Watch Out Situations (the 10 and 18). If all the 10 Orders are followed, in essence firefighters would need to stay home and never engage the fire. Breaking the rules is tacitly reinforced, though not overtly, with rewards. As long as the rules are broken and no one gets hurt things are ok with supervisors and managers and infractions are routinely ignored. However when accidents and fatalities occur there is a management guarantee that some the "rules" have been broken and that a corresponding, **easy to implement,** management fix is

always available: "**Just follow all the rules**" and all will be fine again. Typically the SAI blames individuals for the root causes of the accidents and in particular individuals closest to the accident and typically does not explore why involved people did what they did. There are no SAI guidelines for understanding how to explore mental causality so it is trivialized or ignored and as if it never existed.

This SAI process begs a deeper look at the unstated implications. Behaviorism suggests that management driven rules, regulations, rewards and punishment can fully control firefighter and employee behavior. If this is indeed the case, then involved individuals should never logically be held accountable. If firefighters erred in what they did, then managers and their rules are the causes of those mistakes. *The central issue here is the locus of control for individual behavior.* If it is external and mechanistic then managers and others who set the rules are fully responsible. We can't really hold managers responsible either since their cultures and another set of rules should be controlling them in this mechanistic accounting system. However, if the locus of control is even partly internal, then the SAI guide and management premises that rules can fully control behavior are out of touch with reality. People can only be held responsible when they can reasonably control their own behavior at the time of the accident. And if this is the case, then we must next ask what sort of training fosters such personal control and if management and organizations are accountable to teach it? If you need a non-fire example, look no further than the huge casualty losses in our military for warfighters returning from Iraq and Afghanistan with mental problems. Meditation means both mind training and mind protection, something lost to those who perennially claim to be managers of people.

Unfortunately the SAI seldom goes into any depth into the subjective quadrants to encourage individuals and crews to look deeper either into their minds or cultures for new methods of improvement. Since the SAI as written does not fully deal with human reality it should be abandoned for burnovers and reserved just for aircraft and vehicles accidents. There is constant interaction between rules and mental efforts to manage those rules and still get the work done. Due to limited mental processing people cannot follow all the rules all the time and mostly act on autopilot. You can't even hold you mind on a single object for more than a few seconds so how can we intentionally follow all those rules? We will continue to have rules but must also understand how our minds interact with those rules. Is the APA a better guide?

The APA guide

Next consider the newer, 2010 version of the APA guide, presumably for use in less serious accidents with national level of interest. The APA limits the causal factors to considering cultural and organizational elements and thus cannot reach full validation concerning the entire range of accident causes. Like the SAI it is limited primarily to two of the quadrants. Thus we can never quite trust the stories that an APA spins out of limited analyses. The APA guide is full of quotes apparently to convince users it is worthy of use. The APA process is part truth for what it advocates and partly misleading for leaving out the intentional quadrant. The strength of the APA is that it does makes a stronger effort than the SAI to look at the Cultural and Organizational quadrants while tacitly accepting the Behavioral quadrant so credited with exploring three of the four quadrants. A latent flaw pointed out but still ignored by the APA is that it never specifically recommends bringing in a sociologist or organization specialist to aid in exploring more complex accidents. This is surprising because the APA guide states "*For*

example, a ―human factors specialist‖ can be enormously valuable to illuminate human factors, as well as the cultural and social influences extant before and during the accident." When the APA team has a sociologist or "taboo" psychologist onboard, their written results will appear in a Human Factors Appendix yet these specialists and their Human Factors Report are not mentioned anywhere in the APA guide. So we have to question if the APA seriously explores cultural and organizational causes as stated. It is interesting that many readers of past APA accident reports based on a 4QA Human Factors analysis, written by me, have commented the HF section should be the primary focus of the report, rather than the section currently written up as the official "Story." The APA cites Karl Weick as someone who loves a good Story yet does not cite his caution that "what you look for is what you get." At what cost are we losing a better 4QA Story?

Unlike the SAI, the APA advocates less factual data collection. When we recall an event our recollections are always partial versions of the truth. What we recall always lacks the original causes and conditions of the events that arose and fell away at the time of the accident. APA Team interviewers can conduct interviews and either write down or trust their own memory for recalling the firefighter's words. Whereas the SAI may have an actual recording of the witness testimonies, the APA initially produces only a partial written version of the partial witness testimonies. Later even those team notes may be destroyed. Both the SAI and APA allow the witnesses a chance to correct what has been recorded in the accident testimonies or story, respectively. When we read a partially true APA story we are a long way from the actual causal elements. We have if you will…partial firefighter memories, partially recorded by team member notes or memories, which are partially used to spin an APA story. When we read the APA story it is a part, of a part, of a part, of the original Truth. I personally recommend recording all witness testimonies unless witnesses refuse to be recorded. In that case there should be multiple interviewers writing down what is said and those notes should be typed and preserved. Telling a version of the Truth using the more colorful adjectives found in stories makes duller facts come to life. The APA story approach is a plus if it can stay close to a True Story.

A real issue is whether firefighters will be punished in some way. Not even the APA can guarantee that no punishments will ensue. Firefighters have overwhelmingly told me they will be honest and take blame and criticism for their actions if managers and supervisors do the same. For all these stakeholders the climate should be to identify the causes and conditions and how to promote improvements in all four quadrants. The entire fire culture and the larger culture we live in are full of blame, judgment, criticism, etc. and *Just Culture* rhetoric will not change that. We blame each other out of ongoing habitual, unconscious mental processes yet fail to note similar mental processes led firefighters astray on the fireline. The key for changing blame cultures is refraining from negative behaviors both administratively and personally by reacting less to thinking and talking about blame when it arises. Rather in your mind note that "blame has arisen" then shift to exploring deeper levels of understanding the event. This necessitates exploring your own mental processes in the Intentional Quadrant, which is missing in the APA guide.

The APA limits investigators to considering *objectively observable* behaviors. As a behavioristic model the APA can realistically only recommend solutions that remove, change or

create new rules, regulations, rewards and punishments such as the 10 and 18 i.e. typical external behavioristic methods of control. What the APA model specifically excludes is latent mental causes of accidents, which are almost always the predominant causes of burnover and fireline accidents if not all accidents. That exclusion means there will be no recommendations for improving firefighter minds.

The APA is "mindless" in that it assumes the accident causes are generally not connected to mental intentions, mental observations and mentally planned actions of the involved firefighters but rather due to what the agency or culture… "made" the person do though rules, etc. The authors of the APA argue that if we consider mental errors that this locks us into blaming the firefighters for the accident, just like the SAI, and runs counter to their adoption of the principals of a "Just Culture" where no one should be blamed for causing the accident. This, in turn, suggests no one is responsible for what they do and that firefighters are mindlessly irresponsible for their actions. The APA doesn't formally state the preceding but implies it in its tenets.

Thus, the APA needs to refocus and look at all the human factor causes of accidents: intentional, cultural and organizational. Combining these three with the fourth behavioral area, completes a "mentally healthy" consideration of the possible causal factors. Realistically, we live in a blame culture and even if an APA report doesn't blame specific people, our natural mental tendencies will be to blame them anyway. Just Cultures are somewhat fictitious in that they rarely exist other than as ideals. Day in and day out we are constantly blaming and judging. It is **just** a natural, human mind process to do so. All errors and mistakes are ultimately human and ultimately fabrications as well. Note that we rarely refer to "happy accidents" as due to positive errors because we wish to claim intentional credit for positive outcomes. And we claim to be collectively and individually responsible for earning those positive outcomes. It is people as individuals in cultures and organizations who make the rules which result in errors, mistakes and accidents. So blame is acceptable when the APA targets cultures and organizations conveniently "forgetting" they are peopled by individuals. Positive and negative outcomes are stories spun out of the same mental yarn; it is our judgments that split them apart and suggest when and where to deposit blame.

Although the APA does not embrace the intentional quadrant it does try to bring it in a back door. The APA tell us that "*In effect, an APA's —causal factors are organizational, cultural, and individual human performance-shaping conditions—not causes—that obscure risks, normalize deviations from intentional risk management, encourage at-risk behaviors, or enable simple and inevitable human mistakes to trigger an unintended outcome."* Most readers will note that "human mistakes" as accident triggers sure sound and function like human errors. Unfortunately ignoring errors won't make them go away. There are many factors in operation that produce human error but that **human error most certainly does cause accidents**. Errors are both consequences and causes: a virtual endless chain. They are two perspectives of the same event. Mental errors are based on ignorance of how our minds work. We are continually making mental errors, and those errors are part of the natural consequence of having human minds. Mental errors based on ignorance cloud our minds to keep the error process going. We mostly notice our errors in higher risk environments but they are always with us just the same. Looking for the source of the errors only in the workplace or organization is pure folly. We always have the option to mentally override both cultural and organizational rules and pressures. We must first attach to those rules or they can have no influence on our minds or our subsequent actions.

With mindfulness training we can learn the skill of non-attachment, stress reduction and to be mindful in our present environments. Thus reduction of mental errors is a learnable skill.

Many APA statements are classic scientific, behavioristic misconceptions based upon extending principals of one quadrant into a different quadrant, namely the objective into the subjective quadrants. The primary context in which errors occur is the very context of the mind in and of itself, without reference to the world. Reason, Dekker and the APA authors simply have yet to meet and observe their own minds as they are operating moment to moment. And failing to better know your own mind sadly means you can't truly see that the minds the involved persons in an accident are the main causal source for those accidents. Furthermore this is not to blame such persons, since they too do what they do out of ignorance as to how their minds work. Ignorance is almost always a prime cause and condition for most of our actions, though largely unconscious. Mindfulness makes normally unconscious mental processes observable and then begins to nullify the negative processes that cloud our minds.

A hospital type environment is significantly less hostile and life threatening to its employees and more controllable organizationally; thus many errors, such as failures to wash your hands, are easier to correct by an APA style of guide so it is no surprise that the APA has historical roots as a medical model. What firefighters need is a model that detects where and how the errors occur and what they can do to improve their own minds to keep up with their dynamic high stress jobs in much higher risk environments.

The APA states that the emphasis of their analysis “does not focus on where employees ―made mistakes, nor does it attempt to identify what *should* have been done. Rather, its significance is to illuminate *why* employees actions seemed reasonable at the time.” In truth the APA makes no real effort to "illuminate *why* employees actions seemed reasonable at the time" because the only possible way to do so is to enter the psychological, Intentional Quadrant. Hence the APA fails to do more than record what firefighters **report about their personal reality and says nothing as to how people perceive reality in the first place nor how to enhance those perceptions to minimize future accidents**. This in turn suggests that the APA deliberately ignores human error so the involved cultures and organizations can also ignore human error and absolve themselves from collective responsibility to take actions to minimize the 50 percent of accidents occurring due to individual based human error. Ignoring 50 percent of accident causes means firefighter and employee safety will never be number one as “mindlessly” claimed.

SAI and APA guides

Collectively, the SAI and the APA guides fail to give true accountings of all the discoverable relevant causes, conditions, etc. of accidents. The APA considers one more quadrant than the SAI but it still misses fifty percent of the causes and conditions compared to the thirty percent missed for the SAI. Both effectively fail to account for how firefighter's minds affect what they do on or off the fireline or what can be done to make firefighter minds more aware, make better decisions and choose better actions. Since both the SAI and APA look almost exclusively at firefighter behaviors, rules and regulations etc. and physical conditions they will both implement their findings through adding, eliminating or changing cultural rewards, punishments, rules and regulations. If you encourage investigators to consider mental causes of accidents then the relevant recommendations for improving firefighter minds would be to promote skills like concentration and eastern mindfulness through meditation practices. With better mental skills, significantly fewer rule are necessary. Such skills are suggested in the key finding from an

analysis of wildfire safety after the South Canyon Fire: "The ability to make decisions under stress represents what may be the single most important skill needed to improve firefighter safety. It is arguably the most important human factors change needed in the organizational culture" (TriData Report, 1998, p 5-50). Accident guides that do not promote looking at mental errors and considering mental recommendations are simply out of touch with wildland firefighter's work conditions and their collective reality.

4QA guide

Simply put both SAI and APA guides ignore the reality that *mental events are the most potent latent causes* for most human events including accidents. We are in this predicament, due in part, to Western psychology losing its historical focus on mental events and focusing almost exclusively on outward behaviors; (losing its mind, perhaps)? Currently Western psychology also focuses on rewards, punishments, and sadly drugs to control patient behavior. Once we ask the question: "Are accident causes latent in the mind?" i.e. due in part to mental errors, that we become willing to explore mental intentions, perceptions and conditions as casual factors. If we have minds and use them to guide our actions then mental causes exist and we should focus on what relevant skills are needed to improve our minds. How can we then improve our minds?

The answer is meditation with special emphasis on mindfulness due to its characteristic of enhancing awareness of where we are at, moment by moment, and mindfulness's other main characteristic of neutralizing habitual latent mental elements that cloud our minds. Additionally meditation protects our minds from becoming overcome by stress that is present on the fireline and other high risk activities such as combat. Meditation has a proven track record at least 3000 years old. In understanding this, wiser leaders and managers can foster mindful organizations by offering **mindfulness training** to individuals in those organizations. Blaming naturally recedes and personal responsibility increases at all levels through learning, practicing and promoting meditation in ourselves, our cultures and our organizations. The immune system enhancement plus brian changes in the positive emotion and decision making part of the brain is well documented. Mindfulness is the catalyst needed to best use all our other knowledge and training to keeping us maximally resilient to change and open to new insights. A note of cautions is in order. In the West use of the term mindful organizations is characteristically behavioral in nature. Generally it refers to techniques to foster better attention and discrimination. In the East mindfulness is a mental skill acquired through meditation; thus a mindful organization would be one that teaches and fosters mindfulness meditation for its employees. Consider Matthew Flickstein's (2010) brief summary of eastern mindfulness:

"There are three elements necessary for Mindfulness

1. Bare Attention
2. Concentration
3. Clear Comprehension

1. "Bare Attention" is bare of:
    a. Judgment
    b. Decision
    c. Commentary

2. Concentration does not refer to one-pointed concentration which is exclusive of all other objects; here it refers to momentary concentration that sticks to each successive object in the present moment.

3. Clear Comprehension means being aware in the present moment of the three characteristics of existence:

a. Impermanence; everything is constantly changing
b. Unsatisfactoriness; nothing lasts
c. Selflessness; not driven or determined by a lasting Self. Each self lasts no longer than momentary object contact so there is no unchanging or permanent self to cause the next moment.

When investigators have training in mindfulness meditation and apply mindfulness and the 4QA guide to their analysis then mindful investigations are possible.

Consider the dog and lion parable for learning the Truth (adapted for this paper). SAI and APA investigators are asked to act like dogs while 4QA investigators are asked to act like lions. When you throw a stick at a dog, it chases the stick. When you throw a stick at a lion, it chases the person who threw the stick. SAIs and APAs chase rules, the 4QA chases the Truth: how behavioral, cultural, organizational and intentional elements come into existence in the first place, how they interact and how to improve people's actions by a four quadrant driven analyses. In summary, True Knowledge of accidents and True Stories are dependent upon exploring all four quadrants to best understand the underlying events. Considering mental errors as causal elements in accidents prompts us to recommend mind training to reduce that class of errors. Such training is not considered in the current versions of the SAI and APA.

Historical accident investigations with questionable reporting

The following historical accidents are based on my personal experience and involvement, which will help demonstrate the need for better guides, stories and oversight of the entire accident investigation process.

Mann Gulch 1949

I began my firefighting career in 1963 and worked three seasons on district fire crews. I was first introduced to the Mann Gulch Fire in which 13 firefighters died, while training as a Smokejumper in Missoula in 1966. As a new recruit who had never been on a really dangerous fire Mann Gulch was more a story than a crucial fire lesson. One needs more fire experience to truly know the deeper meaning of such tragedies and how to profit as a firefighter from the telling of the story. In 1992 Norman Maclean's "Young Men and Fire" provided the first detailed and widely read account of the Mann Gulch fire. Prior to Maclean's book I had seen "*Red Skies Over Montana*" several times. The movie was entertaining as long as you didn't let the fake fire scenes bother you. By the time I read Maclean's book in 1995 I had become highly skilled at analyzing firefighter actions when confronted with burnovers and by then was the Forest Service leading expert for conducting the fatality site analysis part of the investigations.

My first entrapment investigation began with the Battlement Creek Fire in 1976. Years later as a member of the 1990 Dude Fire fatality investigation team I wrote a special report on the fatality site specifics resulting in the deaths of six firefighters. This skill was captured as a primary duty in my formal job description as of March 1994 and said *"Conducts complex and detailed analysis of firefighter entrapments to determine interactions of firefighter behavior, the equipment used, fire behavior, and the resulting injuries or fatalities. Specialist is the pioneer in advancing scientific knowledge in this area*." Thus I read Maclean's book after the South Canyon Fire from the viewpoint of a very skillful fire fatality specialist.

In the reading of Maclean's book I was aware of many fire behavior points he made that were fictional elements as opposed to factual elements. For example saying people will be burned breathing in 140º F air when research shows people have breathed in air temperatures up to 450-500º F. This indicated that Maclean did not have the advice of a fire accident expert at the time of collecting the book materials who could skillfully interpret the relevant evidence or more importantly, notice the **lack of it**.

Of more significance was my reaction to the book as a whole soon after finishing it. I began explore my psychological observation that District Ranger Jansson had a classic guilt complex based on Maclean's account of the ranger's life after the Mann Gulch fire. I next posed the question "What was the ranger guilty of?" Immediately my question was answered with a flash of insight that the ranger had set the fire that killed the thirteen firefighters. That insight burned deeply into my mind more than anything Maclean had written. Whereas Maclean's story lacked a ring of truth my insight had that ring to it. Part of what I saw in my mind's eye was someone looking up just after lighting a fire, seeing something uphill and immediately, frantically trying to put out the fire he had just started. When a small whirl of fire burned this man, he stopped trying to put it out and fled. From accounts of Mann Gulch the only person known to be at the bottom of Mann Gulch, about the time the "spot fire" ignited, was the district ranger as he himself testified. What is noteworthy is that only the district ranger was allowed to talk about the spot fires in the bottom of Mann Gulch. At the Board of Review hearing no one else was allowed to contradict or question the ranger's story.

I also knew instantly why the ranger might have lit the fire that killed the firefighters because I had a near miss fire experience of my own, early in my career as a district firefighter. I was with a crew burning a large clearcut. The clearcut had roads contouring across it so we had started at the highest road igniting the fuels above it with propane burners. When we had worked down to a road about a quarter of the way below the top of the clearcut I heard someone yelling above the sounds of the propane torch I was using and the resulting fire above me. Looking up from igniting fuels and seeing another crew member waving franticly, screaming and then pointing downhill caused me to look downhill too. I saw a huge wall of flames coming uphill from below and beginning to surge towards my location. As I ran I began to wonder how any fire could have got below us. Later the district Fire Management Officer (FMO) told me the district ranger had lit the fire below our burnout crew. The FMO went on to explain that it was embedded in the District Ranger psyche, possibly from forestry school contacts, "that it is ok to do such acts in order to create a large scale fire on your district." As the "fire boss" you then get your name in the news and notoriety within the Forest Service; in short name recognition. With ranger name recognition, comes job upward mobility. Previously I had observed several times as a smokejumper, on fires with district personnel, that someone was tossing burning materials

outside our fireline soon after we had moved on to another part of the fire. At the time I reported this to my Jumper Foreman and he just smiled and said welcome to the darker side of wildland firefighting.

At Mann Gulch the ranger had said embers from that main fire had traveled to the bottom of the gulch by winds flowing counter to the prevailing winds, counter winds that only he observed. He then saw spot fires and fire whirls and the fire in the bottom begin to spread. The ranger was burned by the fire in the bottom of the draw before he left Mann Gulch. In summary, there is time, location and possible intent to connect the ranger to the "spot fires" that killed the thirteen firefighters. Four of these spot fires are all in a row next to a trail which today would immediately suggest arson.

Whereas the above suggests but doesn't prove the ranger lit the fire, I strongly feel the Board of Review Investigation was a cover-up from the start, especially in its failure to take a closer look at the nature of the "spot fires" and the rangers' behaviors. This was obvious to me when I read the report after reading *Young Men and Fire*. A careful, critical analysis of the *Board of Review: Mann Gulch Fire, Helena National Forest, August 5, 1949* shows that the ranger's testimony was taken first and all other testimony bended to match it. When other witness mentioned testifying what they saw in the lower part of Mann Gulch they were interrupted and ask to talk about something else. Much of the ranger's testimony talked about a string of highly improbable events occurring simultaneously to create the fire that subsequently ran uphill to burn over the firefighters. One event was embers traveling against prevailing winds and another was about fire pushing downhill to his location against the up canyon winds. The ranger talked about a crown fire burning uphill to where the men died yet photo evidence shows a grass fire, not a crown fire, caught the fleeing men. Extreme pressure was put on the three survivors to cooperate with the Agency's Storyline and Timeline. Later the ranger said he too had been pressured into a common timeline. The ranger refused to look any of the board of review members in the eye and gave his testimony sitting in a chair with his pack towards the board members. For most of us, lack of eye contact suggests a person is not telling us the truth. What caused the spot fires that killed the firefighters rests solely on the ranger's testimony. Most witness accounts of the fire behavior, wind direction, flame heights, etc. disagree with the ranger's testimony but was not seen as problematical by the Board of Review.

A Fire Expert who wanted to observe the spot-fires' origins was forbidden to do so by the Team Leader, since it was not in the scope of the investigation. In the case of the Board of Review it is <u>what they ignore</u> and don't talk about that screams of a cover-up. Why would the Board of Review become involved in a cover-up? Just follow the money. If the ranger started the killing fire the Forest Service was libel as well as embarrassed should that Truth come out. There is evidence the ranger was also pressured to tell the story the way he told it. The only person on record to investigate the fire start in the bottom of Mann Gulch was Harry Gisborne, a local and nationally recognized fire behavior expert who worked at Rocky Mountain Research Station next door to the Missoula Smokejumper Base. Jansson was one of Gisborne's students at a University of Montana fire class. He and the ranger went back to Mann Gulch together to look for evidence of fire whirls and crowning that Jansson had reported. Gisborne had preexisting heart problems and died on the way out of Mann Gulch; so possibly the fourteenth fatality? Did Gisborne observe something that upset him enough to trigger a heart attack? Or did the only witness to his

death, the ranger, tell the Truth when he said Gisborne found evidence to support his own board of review testimony?

Later, Wag Dodge, the supervisor of the men fleeing the blaze below, told a fellow smokejumper "We were burnt out from below". Dodge did not elaborate. Why not? It would be normal to add in the details. To stop short and clam up to a friend suggests that he opened a door for all hell to break loose and quickly slammed it shut before the mental flood-gates burst open. Was the ranger guilty as I have suggested and were Jansson and Dodge keeping explosive mental pressures just barely in check? By May 1951, Dodge learned he had Hodgkin's disease and died January 12 1955; Mann Gulch's 15th fatality? In 1964 Jansson contacted incurable kidney disease and died in 1964; Mann Gulch's 16th fatality? My psychological instinct notes both deaths were likely stress induced and/or accelerated. Do we now have our fifteenth and sixteenth fatalities? I think so as I have observed similar tendencies with other fatal entrapments. It is far better to tell the whole truth up front because otherwise an axe is hanging over both Agency and firefighter heads for a long time. I have been told some firefighters they would have preferred the truth up front, even blame, so they can deal with the pain now, given a chance to let it go and get back to less stressful living. We do no one a favor by protecting them from public knowledge of their actions in accidents.

This leads to another related mystery. How could Maclean miss something so obvious? Was Maclean deceived from the start? Maclean had no access to an expert for advice and was not familiar enough with wildland fires or investigations to see the obvious discrepancies. Did the Forest Service, in what help it gave to Maclean, deliberately lead him astray? Maclean did not finish his book before his death, though could have. Did he let it sit on the table until his death because he began to see a larger truth? Lots of questions and many of the answers are now known and other parts of this cover-up are still under investigation. From an accident analysis perspective the ranger lighting the spot fires is the least complicated explanation, thus the most likely one to be true. The highly improbable fire scenarios and elaborate cover-up efforts **make sense** if the ranger lit the killing fires.

My summary points are that Mann Gulch was an elaborate cover-up from the start, did little to help future firefighters and mostly protected upper level managers and the Agency's images. I invite readers to go back and take a more thorough look at the available evidence and to realize, like I have, that the Mann Gulch investigation set the pattern for later fatality investigations, namely that it is ok to cover-up the truth and blame firefighters and fire behavior than mental errors, cultures, managers or organizations. If our accident investigations don't promote finding and telling the Truth then Lessons Learned, firefighter safety and High Reliability Organizations are just convenient buzz words; lullabies numbing us out rather than keeping us awake to underlying conditions and causal elements which best account for our collective firefighter realities.

South Canyon fire 1994

On the South Canyon Fire July 6, 1994, fourteen firefighters were entrapped by a wildland fire near Glenwood Springs Colorado, not far from the 1976 Battlement Creek Fire. The entrapment investigation was conducted under an SAI type of procedures and protocols. True to such protocols the investigation mostly sought to determine what had happen and to blame those responsible. From the beginning there was more emphasis on speed to get the report

out than on a quality factual report. Much was made about firefighters failing to follow the Ten Standard Fire Orders or to adequately use the Eighteen Watch Out Situations. As said earlier these accident elements follow behavioristic interpretations of accident causes. Early in the investigation someone on the team leaked information to the press that the firefighters had too much of a "Can Do" attitude. I pointed out the whole fire culture reinforces a Can Do attitude as a positive trait but it had already become a convenient way to blame the dead firefighters. As a team member I then felt that the leak was clearly designed to shift most of the blame downhill onto the firefighters and away from local BLM management miss-directions that preceded the fire ignition and continued throughout the fire suppression efforts well after the fourteen died. Months later the federal OSHA investigation brought some blame back to the Grand Junction District of BLM as did John Maclean in his **story** version of the South Canyon Fire: "Fire On the Mountain". Despite these and my own efforts to get the larger Truth out, several years after the South Canyon Fire most of the blame was still on the firefighters themselves. I was the only team member who did not sign the South Canyon report and was ordered to say why in a letter to the Chief of the Forest Service…my Chief. I said much in the report was incorrect, misleading and contradictory so should have been changed. However I said my biggest reason was that we had stopped at reporting **what** had occurred and said almost nothing about **why** it had happened. Our Agency heads were all too willing to let the investigation end without knowing other, more fundamental causes.

Many causal factors for the deaths at South Canyon were never mentioned in the official report. This was not a direct reason why I did not sign the report. I did not sign the report mostly due to it being poorly written as stated above. Too many errors were present which would lead readers into false conclusions; likely by design to shift blame away from BLM managers onto the dead firefighters. I had marked up three pages that were more of what most people would consider "editorial" in nature. The causal factors being covered up were not part of refusing to sign the report because our team leaders told us that the report being printed for "public analysis" was the best we could do in the allotted 45 days. Team leaders assured other team members that the final report would include all the casual factors after we better understood them by continued analysis. Historically I do not know if this was an up-front lie or if the decision to axe the final report came later. Thus the South Canyon report has elements of deliberate cover-ups like Mann Gulch and elements of partial cover-ups, with the promise that another report is coming and "trust us to fix the problems later." No later team report was written. Had I known that no further report was going to come out then the primary reason for not signing the report would have been the failure to report all the prime causal factors for the fourteen deaths.

I was ready to "go public" by telling what I knew to a willing press source. I was asked by a Deputy Chief to wait and give the Agencies a chance to improve. As part of waiting I insisted the Agencies support an in-depth look at the entire fire safety culture. This became the B-1 initiative and was later contracted to the TriData Corporation in 1995 and the results are now known as the *Wildland Firefighter Safety Awareness Study.* Because I had not signed the South Canyon report I was "blackballed" from attending most meetings for the rest of my career. The group putting the B-1 contract together would call me at night at home and ask for my opinions on how to write the contract. However they could not allow me to come to their location to help them write the work statement face to face. This contract team could not decide what the contract work statements should be so "lifted" them out of the recommendation section of a February 1995 article I had written on South Canyon. I received hundreds of positive emails from the

article which introduced Human Factors to wildland firefighters. With such overwhelming positive feedback, in early 1995 I asked and received funding to sponsor a Human Factors Workshop in Missoula in June (see USDA Forest Service, 1995). Both studies have been instrumental in keeping HFs present in the collective consciousness of the wildland fire community. Later I asked fire experts at the Rocky Mountain Research Station in Missoula if they could provide clarity to the physical aspects of the fire that overran the firefighters. In a cooperative venture we produced the most accurate fire behavior or "What" account of South Canyon Fire to date (Butler et al, 1998). Most of these extra efforts arose because I did not sign the report but much has been lost by not telling a Truer Story of South Canyon from the beginning.

Alabaugh Canyon fire 2007

In 2007 I was asked to participate in the Alabaugh Canyon Fire accident investigation team. I was told that the accident was technically a SAI but that upper managers had agreed to conduct the investigation using the APA guide and protocols. I was very concerned about the team results being used to blame or punish the involved firefighters and was told that the APA we would use protected the firefighters from any punishment. I went so far as to say it was a condition of hire for my participation and was again assured that there would be no punishments administered. I learned I was hired to bring credibility to the APA process itself. This now seems absurd since I have suggested changes to the APA for years and my suggestions have been almost totally ignored. This failure to adopt reasonable changes to the APA was a major reason for writing this article.

As a team we began the interview process by assuring those firefighters being interviewed that there would be no punitive actions taken and encouraged them to tell us the whole truth. The interviews were written up, modified by the witnesses as needed and then signed. It was only later as we were doing final editing of the report that I began to feel uneasy. I was aware of no team meetings where any of the team members suggested blaming the firefighters, who got injured, for their own injuries. But the hint is always there when anyone implies all firefighters must always follow the Ten Standard Fire Orders. Thus over ten times I tried to eliminate that threat by removal of the "Ten.". My concern was that even if our team did not apply blame to the injured firefighters that the report, as written, still implied blame it by mentioning the "Ten" were not strictly followed.

Specifically the report says on page 5 "This investigation was also conducted in the spirit of the "Foundational Doctrine" for fire suppression activities. A fundamental difference in how this investigation was conducted, from those of the past, is that the team looked at how the Ten Standard Fire Fighting Orders, Watch Out Situations, LCES, and Downhill Line Construction Checklist were complied with, not as absolute rules, but rather as principles that require sound assessment and reasonable decisions. Consequently, the team sought an understanding of not only what choices were taken, but why individuals made the decisions. The team looked at the actions of the incident command team and individual firefighters with the philosophy that: "*employees are expected and empowered to be creative and decisive, to exercise initiative and accept responsibility, and to use their training, experience, and judgment in decision making to carry out the leader's intent"* (Foundational Doctrine, 2006). However, the Foundational Doctrine does not relieve leaders of accountability." We conducted the investigation under the

guidance of the above paragraph, yet the last sentence is the un-doer of all that precedes it as it leaves the door wide open to judge, blame and punish.

When it became apparent that the "Ten" were going to remain in the report, I wrote and "we" used paragraphs like the following on page 6 to add perspective back into the report "The ability to assess and assimilate situational awareness and operational risks naturally degrades under extreme and chaotic conditions. The Operations Section Chief and the Division Supervisor are less likely to notice relevant information that may have altered their decisions and the subsequent events. Such conditions are also trigger points for considering disengagement from the fire. Consequently several of the LCES factors, standard firefighting orders and watch out situations were not followed, which led to the entrapment and shelter deployment." If you clearly understand the above paragraph and know from a psychological perspective that long term memory fails under stress, you also have a clearer understanding why cultural and organizational rules across the board also fail. They are rarely "mentally present" when all hell breaks loose. Yet they are then foolishly used to blame firefighters who performed their best under extreme conditions for not obeying all the rules, which are impossible to follow under the best of conditions.

The APA suggests the firefighters must see the future consequences that their actions will cause harm and do them anyway with deliberate intent as a basis for punishment to occur. At no point did we find deliberate intent as a team. Yet after the report was finished the two firefighters who were injured and their fireline supervisor were punished. Not only was this subsequent punishment barbaric and unjustified but it also went against the entire intent of the approval to use the APA in lieu of the SAI process. Not to mention that it also condoned lying to those same firefighters who were assured that if they spoke openly about what had happened then no punishment would follow. Clearly I was hired under false conditions that the Forest Service contractually did not follow. A small moral and ethical inconvenience to the Agency compared to those at Mann Gulch and South Canyon yet still a shameless act.

To a lesser degree this has led to my punishment as well. I was asked to join this team so my reputation to tell the truth would add credibility to the new APA guide. Since I told those firefighters they had no fear of punishment I have experienced the guilt and shame of unintentionally deceiving them. I have since met and apologized to two of the firefighters but there is really no way to undo what a mindless supervisor later did to them. We hear a lot about Just Cultures but should firefighters ever buy into more rhetoric that sounds good but never lives up to expectations since, after all, we still live in Unjust Cultures including our own Unjust Minds. Recall again that the punishments exist as part and parcel of our behavioristic analysis of fire cultures and organizations due to the behavioristic SAI and APA processes. We need clauses in the APA to allow punished firefighters a means for holding their punishers accountable. I have also been told my own reputation suffered due to this aspect of the investigation thus another reason to expose the lack of Justice fostered using both the SAI and APA.

Earlier at the start of this paper I argued that supervisors are clearly just as guilty, if not guiltier, and should have been given even worse punishments. The Foundational Doctrine is flawed when says "*employees are expected and empowered to be creative and decisive, to exercise initiative and accept responsibility, and to use their training, experience, and judgment in decision making to carry out the leader's intent"* but does not defend those same employees when events turn sour. Neither does Foundational Doctrine provide the funding for those employees to get all the training needed to function at the level of firefighting they find

themselves embedded in; and especially training to reduce the effects of mental stressors. We still blame the dead and injured and yes … blame still rolls downhill.

To change for the better, the APA must enter into the Intentional Quadrant, and bring balance into fire accident investigations by using all four levels of analysis to improve firefighter safety. Without it APA Stories deteriorate towards telling Lies rather than reflecting the Truth. Real understanding of this inherent problem starts with yourself and changing yourself begins when you become a student of your own mind by actually observing your own **mental processes** (not content)…processes so near at hand, perhaps "near in mind," yet so far away in their actual observation.

Crandall Ranger Station tree felling accident 2010

Briefly, the Crandall Ranger Station Tree Felling Accident (USDA, 2010) began as a FLA process. After presenting the results to the Shoshone National Forest staff the general feeling was that the real causal factors were not completely known. The Shoshone National Forest has adopted the principals of HROs and thus more concerned than most agencies to look for the underlying causes to stay resilient as employees and as an organization. Since the report was short on **sensemaking** (Weick 1995) the FLA facilitator, Matt Gibson, recommended bringing in a HF psychologist to help make or bring more **sense** to understanding additional causal factors. This shifted the investigation towards an APA process and more specifically into exploring the Intentional Quadrant.

Consider the following excerpt from the Crandall Human Factors section I wrote:

"The AFEO (Assistant Supervisory Operator, the injured tree faller) had agreed to meet with some of the team to return to the accident site. Concerned that the normal response is to become defensive amidst a group of investigators looking over his shoulders we opted to ask the AFEO to join our team. The AFEO was to be our felling expert and conduct an ASI (Accident Scene Investigation). As such we asked him not to focus on what happened but to just follow physical evidence and tell us in detail what he was observing and what the evidence meant.

Initially the AFEO was hesitant to go directly to "the stump" as it was too traumatic. Showing some resilience, another team member (Gibson) suggested starting the process by analyzing the stump, butt end, and other downed logs associated with the tree cut by one of the A fallers. The AFEO warmed into this analysis and demonstrated a wealth of knowledge showing us he indeed did have the prerequisite skill to size up and mitigate related felling hazards. When quizzed, he also had some misunderstandings. When the SFEO (Supervisory Engine Operator) agreed with the AFEO we learned the mistake was common to both of them. (As the one most ignorant of the fine art of felling trees, I learned a lot about complexities involved).

After a break the AFEO came back to the immediate area of the accident and soon began to look at the physical evidence and tell us what it meant. He took time to discuss the hazards and his reasons and expectations concerning mitigating them. Next he executed a detailed sequence of actions showing where he went, what he did there, and why he did it that way. One team member followed his actions of gunning the saw and was surprised to see that when sighted from below in the position the AFEO had been in, the sight line was near the base of the tree. The surprise

came because when looking at the sight line up at the level of the stump, the sight line was lined up pretty much where the tree fell. This did not make up for the many errors but was clearly related to why the AFEO's expectations were so far off the actual outcomes. As a team it was quite literally worth the extra effort to "see what they saw at the time of the accident" and to "... truly understand why the decisions and actions leading up to the accident made sense to them at the time. We have come full circle back close to where we started. We have learned much and are grateful for the chance to have learned it. We hope what the AFEO and accident taught us extends to readers and others as well."

The essence of the above excerpt is the interaction by the injured tree faller, the facilitator and myself to all get involved to create an environment for clarifying the very difficult understanding of interactions between what the timber faller was professionally trying to do Intentionally, along with some of the supporting Cultural aspects to allow all of us to appreciate what went amiss. With the resulting Human Factors section added to the report, the forest administrators felt this addition helped bridge the gap of understanding and the investigation report was completed and formally accepted. It exemplifies the potential robust nature of the four methodologies in the OLO guides and the ability to shift emphasis as needed. In showing the relevancy of the Intentional Quadrant it also exposes the fatal flaw in the APA guide.

Recommendations

1. Consider combining the APA and AIG (SAI) into a single four quadrant document. If two guides are still needed it would make more sense to have the AIG used for vehicle and aircraft accidents and other machine-human interfaces. The APA would handle non-vehicle accidents, including fatalities, where all four quadrants are paramount...such as in burnovers.
2. Both guides should be written to include and promote all four quadrants. If they do not do so then there should be clear statements, up front, in these guides that state they will not look at certain classes of data; for example mental errors or causal elements and the clarification this results in a loss of 50-70 percent of recoverable causal factors.
3. Implement a guide or matrix for when to bring in quadrant specific skilled investigators such as sociologists, organizationists, and psychologists, for example. Both guides are already robust with respect to bringing in behavioral experts for weather, fire behavior, equipment, fuels, etc. because the team members are mostly firefighters.
4. Create and maintain a list for professionals skilled in the various quadrants. For less serious events keep another list for agency firefighters who also have undergraduate degrees in these same areas. Many firefighters with degrees in sociology, organizations, psychology or decision making etc. can help explore the quadrants for less cost when it is deemed appropriate by Administrators, the Team Leader and others. The lists are necessary so these specialists can be called upon quickly.
5. All team members who will conduct interviews should have 3-5 days of formal training in how to conduct interviews. They must also understand what questions should be asked for each quadrant. If no one asks cultural related questions then it will appear there are no cultural causal elements and the team would miss such causes even if cultural causes were the most crucial to learn.

6. It would help to have a chart that guides interviewers in what observations or questions are pertinent in each quadrant something like:

INTENTIONAL	CULTURAL	ORGANIZATIONAL	BEHAVIORAL
Thinking	Trust	IMT Members	Fire Behavior
Perceptions	Respect	NIFC Response	Weather
Focus	Mutual Views	Rules and Regulations	Individual
Feelings	Cohesiveness	Qualifications: Red Card	Yrs. Experience
Hunches	Crew Image	Safety	Red Card Rating
Views	Conventions	Support & Equipment	Clothing
Stresses	Professionalism	Organization Chart	Fire Shelters
Truthfulness	Relationships	Rewards & Punishments	Fitness
Self Image	Leadership	Skill Mix	Skill Level

Note: Many of these items could be found in more than one quadrant.

7. Related to interview techniques is requiring digital recordings for all interviews. Interviewers should also take notes for immediate team use. It is helpful for interviewers to later compare their hand written notes with digital copies to see if they have any systematic biases for what they record. The other reason for better data collection is that if the team members miss trends in the data, later researchers may discover them. All data except graphic body photos etc. should be made publically available to maximize lessons learned.
8. Develop a guide for firefighters and employees about interaction with accident teams. What is expected, required, optional, etc. Procedures to follow if your rights are violated. Since cover-ups are more the rule than exceptions, develop penalties for deliberate cover-ups, how to report them and have the offenders removed from the team...even deputy chiefs. Learning lessons is very difficult when investigation teams have the option to lie to witnesses or refuse to look for or report sensitive causal factors. We hold firefighters responsible now and we are long overdue to hold accidents teams accountable for their behaviors.
9. The APA promises no punishments, reprimands, loss of promotions earned but never given, etc. But if later negative actions against involved parties appear to be due to the fire or accident events, then what are your options for review? What are procedures for holding supervisors accountable for more professional behavior?

Discussion and Summary

The SAI has remained essentially the same for forty years but is currently under revision. The SAI does a good job at accidents involving aircraft and vehicles but only a fair job in burnovers where firefighters are the center of what went amiss. This state exists due to the SAI roots in aircraft and vehicle (physical orientated) accident protocols that primarily consider externally observable human behaviors and not mental processes per se. Thus the SAI is essentially a WHAT happened process likely to uncover only 30 percent of discoverable causes.

Since there is no deep understanding of the mind the SAI is left with blaming the body and hence the person involved in the accident. After all, the body is just another vehicle.

The Newer APA also delves primarily into the WHAT and meekly into the WHY if it appears to have cultural or organizational roots but views mental roots as too blame tainted to explore. Since mental roots are the sine qua non of all human involvement, the APA mostly pays lip service to the WHY aspects of accidents. Partly this is a natural result of the APAs roots as an epidemiology "blame" model taking its cues from the medical profession. The APA seems to have missed that firefighting is not a medical profession and that the medical model was inappropriate from the beginning. Relevant wildland fire accident guides should target firefighter's struggles to stay aware of and make decisions in fast tempo, high-risk environments where mental processes are acutely necessary. Considering the above the APA is likely at best to uncover 50 percent of discoverable causes. Said another way the SAI and APA guides use are associated with tripling or doubling accident rates, respectively, for what they ignore.

Some form of a **4QA** guide is the only model likely to uncover up to 100 percent of discoverable causes, thus the only viable type of guide for people in high-risk environments. The 4QA guide gives us the best opportunity to maximize safety and minimize accidents.

Accident investigations are like experiments. You need to decide what you want to know before you can know how to get it without inducing unwanted errors into your data collection and conclusions. What the present accident guides show is a blatant disregard for sound observations, data collecting and how the design (guide) limits conclusions and searching for underlying causal elements. All accident guides should therefore clearly state what they are designed to find and what they are designed to ignore. Choice of the relevant guides predetermines your accident results. Do you want to consider the two-quadrant SAI, the three-quadrant APA or create a new four-quadrant 4QA guide? This predetermines the percent of causal factors you may uncover: from 30, to 50 and up to 100 percent respectively. Actual percentages also depend on the skill of the investigators, the willingness of the witness to testify truthfully, the time and costs allowed for the investigation, and so forth.
One way to consider what adding the Intentional quadrant brings to an accident analysis would be to read the Human Factors sections of reports from accidents where I have been a human factors team member and added in mental causal factors. These four-quadrant reports are:

1. Alabaugh Canyon Fire, 2007
2. Cascade Complex Fires, 2007
3. Indians Fire, 2008 and
4. Crandall Ranger Station Tree Felling Accident, 2010.

The Indians Fire contains an added comparative account as it has essentially two human factors sections. My section emphasizes the intentional quadrant and one by Jim Saveland emphasizes the behavioral aspects of the cultural and organizational quadrants per APA guidelines. These reports are available at the Lessons Learned Center: www.wildfirelessons.net.

With respect to accident investigations I am convinced, as an expert accident investigator, that the current accident guides are more than twenty years out of date. Problems include:

- Failure to promote using all four quadrants, especially the mental, intentional quadrant.

- No current accident guide recommends that firefighters **tell the truth** and that what they say be made **publically available**. This information is crucial for determining human factors causal factors. Such data is also needed for trend analyses and possible later insights into new causal factors.
- Little to no formal training for investigators. We tend to muddle through with whoever is available at the time. Most often investigators are fire experts with little understanding of mental, cultural or organizational processes.

- Fictitious concerns for firefighter's protection. "Firefighter's won't tell the truth if everyone knows what they have said." Firefighters actually say they are willing to tell the truth and accept responsibility for their decisions…if others, including management do the same on a level playing field.
- In the APA there is too much Just Culture rhetoric which misses the point that blame is inherent in **fire** and **human** cultures because it is inherent in the way our minds process information. Stopping at WHAT begs our minds to **automatically** apply blame. You cannot stop your mind from applying blame but you can change your relationship with your mind by noting that blame has occurred then proceed directly to exploring the WHY. By examining our mental processes with mindfulness, we acquire skills to move beyond blame directly without the Just Culture rhetoric which, after all is just more rules and regulations.
- In accident investigations, as with examining our own lives, it is cheaper, quicker, and less immediate stress on us to use blame and punishment than on more costly, longer term, and farther reaching techniques using rewards and mental enhancements to improve decisions and understanding.
- No formal documents clarify firefighter rights during an accident investigation. There is a need to explore choices and rights during testimony and how to take actions against investigators who distort or lie about the investigation procedures or processes. There should be steps taken against supervisors and manager who apply blame and punishment indiscriminately as is now the case in the wildland community.
- No document, like the OLO, exists to guide Administrators and the initial Accident Team Leaders for determining what team members are needed for a specific accident event. Too often experts are left off the team or brought in well after the data collection and initial interviews are finished. This process results in skewed data collection and the experts miss the most accurate witness comments which are most truthful just after the events occurred. Days or weeks later the Truth has already gravitated towards Stories in the minds of those involved. This trend is not deliberate lying but more deceptively, occurs automatically because that is the natural way our minds react to such involvements. Experts cost more and may not always be necessary but it helps if criteria are set up to suggest or trigger when experts are needed up front. Once the Team Leader has a rough idea what happened they must decide if they need specific experts from any of the four quadrants. It may be simpler to always have them for fatalities and strongly considered for severe injuries. Such OLO trigger points are necessary in guides because they improve the decision process

when administrators and accident teams are themselves under stress and time constraints to act quickly.

- The following table briefly summarizes the fires covered in this report. Punishments refer to known or formal punishments and do not include less obvious ones such as not being promoted, loss of respect and so forth. This table is based on what I know about the referenced fire events:

FIRE NAME	FULL COVER-UP	PARTIAL COVER-UP	NUMBER OF QUADRANTS	INVESTIGATOR QUALIFICATIONS QUESTIONABLE	PUNISHMENT METTED OUT	
MANN GULCH	Y	N	1:B	Y	Y	
SOUTH CANYON	N	Y	2:B,O	Y	Y	
ALABAUGH CANYON	N	N	4:B,O,C,I	N	Y	

Note: the quadrant letters refer to the first letter of the quadrant name i.e. B for Behavioral.

- In reviewing several accidents it is apparent that there is some deliberate covering up of causal factors by the agencies in charge of the investigations. This is an administrative problem and continues to exist because there are no counter deterrents in place. In truth, agencies like to have the option to protect the Agency's image, protect their managers and to ignore unsavory causal elements. This criticism is somewhat independent of which accident guide is used.
- Many actual causal processes are never looked at during the entire investigative process. This may be a result of not having the right "quadrant" professional on the team. You usually only find what you are trained to find… given that it is there to find. Few investigators really look closely at all the processes, logic, conclusions, report sections, data verification, soundness and omissions that are necessary for the report to have integrity and a "ring of Truth." Such breadth of skills is more likely from those with higher degrees.
- The APA is long on rhetoric but short on a real, deeper understanding of accident processes. Both guides can boast they rival industry and other government standards but it only points to the fact that most organizations do not want to look at deeper subjective factors. All accident guides, even those poorly written, can produce reasonably good reports if they have top notch people on the teams. This reflects the deeper truth of this paper. Namely that good minds and thinkers can override rules, regulations, doctrines, rewards, punishments …and accident guides… to produce quality products. Or on the darker side poor minds and thinking, in the same environment muddle through…with few observations, weak accident reports and loss of learning from mistakes.
- We are long overdue in organizing to promote mindful employees by exploring and providing training in the Intentional Quadrant, which is where true mindfulness and resiliency reside.

This paper began by suggesting a common thread exists between accidents, accident guides, stories and Truth. The common thread is our minds. An accident investigation analysis is simply a group experiment to tell the truth and the Four Quadrants are our experimental guidelines to enable us to come closer to that Truth.

Human minds are the root source for all Storytelling; in essence an ongoing Storyteller. Things begin to get problematical when we believe that our own Stories, thoughts, concepts, beliefs, etc. are somehow ultimately true when at bottom they are always mental constructions. Such fabrications are automatic processes of our minds and you can't stop these processes without specific mind training. What is needed is to observe your own mind as it spins all its stories and realize they are **just stories**. Our mental constructions only become problems when we **attach** to them. Attaching leads to cloudy minds with resultant future problems. By now it should be clear that the biggest Story of all is our **Self Story** Letting go of all our stories brings clarity and freedom. By staying unattached we are ready to enjoy the next story or event clearly because we have already let the previous one go. Hopefully you will begin advocating changes in the entire accident investigation arena and begin personally observing your own mental processes with mindfulness.

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APPENDIX-A

A BRIEF FOUR QUADRANT ANALYSIS (4QA) ACCIDENT INVESTIGATION GUIDE

Accidents and events have processes at play in all four quadrants. Different quadrants may dominate depending on the event. The methodologies differ in each quadrant and thus should not be used in adjoining quadrants without entanglements. Adapted from a table and guides in Ken Wilber's *A Brief History of Everything*.

INTERIOR, INDIVIDUAL	**EXTERIOR, INDIVIDUAL**
INTENTIONAL	***BEHAVIOURAL***
Mental/ Mind /Consciousness Latent Human Errors Thinking, Images, "Slides" Introspective Psychology	Body/ Fitness/Nutrition Environment Personal Behavior Operant Conditioning Psychology
I	**IT**
INTERIOR, COLLECTIVE	**EXTERIOR, COLLECTIVE**
WE	**IT**
CULTURAL	***ORGANIZATIONAL***
Mutual Understanding Communications Leadership Shared Beliefs & Consensus Situational Work Ethics	Crew Structure Fire Organizations NIFC/NWCG Doctrine/Rules/Standards Rewards/Punishments

Cited Accident Guides and Outputs:

SAI: primarily uses the Exterior Quadrants: Behavioral and Organizational
APA: primarily uses the Collective Quadrants: Cultural and Organizational
4QA: recommends using all four Quadrants: especially the intentional/mental quadrant

SAI places blame on what is objectively seen with recommended changes in organizational regulations, policies, rewards and punishments.
APA places blame on cultures and organizations with recommended changes to the corresponding regulations, policies, rewards and punishments.
4QA places responsibility on people in all quadrants by noting what people are aware of and reacting to in the present moment with recommended quadrant specific training for personal improvement.