ACCIDENT PREVENTION ANALYSIS
IMPLEMENTATION GUIDE

U. S. FOREST SERVICE

RISK MANAGEMENT & HUMAN PERFORMANCE

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"Leaders create culture. It is their responsibility to change it. Top administrators must take responsibility for risk, failure, and safety by remaining alert to the effects their decision have on the system. Leaders are responsible for establishing the conditions that lead to their subordinates' successes or failures."[*]

"But human error is a consequence not a cause. Errors . . . are shaped and provoked by upstream workplace and organizational factors. Identifying an error is merely the beginning of the search for causes, not the end. The error, just as much as the disaster that may follow it, is something that requires an explanation. Only by understanding the context that provoked the error can we hope to limit its recurrence.[†]*"*

". . . strategies to reduce the probability of mistakes and accidents need to address the relevant social conditions located in the organizational system. Thus, the lessons for managers and administrators from NASA's two accidents are, first, that in order to reduce the potential for gradual slides and repeating negative patterns, organizations must go beyond the easy focus on individual failure to identify and correct the social causes located in organizational systems. Second, designing and implementing solutions that are matched to the social causes is a crucial but challenging enterprise that calls for social science input and expertise."[‡]

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[*] *Columbia Accident Investigation Board,* August 2003, Vol. 1, Ch. 8 *"History as a Cause"* Available online at: http://caib.nasa.gov

[†] *Managing the Risks of Organizational Accidents*, by James Reason © 1997 Ashgate Publishing Limited

[‡] Dianne Vaughan *on Slippery Slopes, Repeating Negative Patterns, and Learning from Mistake.* An Article included in: *Organization at the Limit: NASA and the Columbia Disaster* by William H. Starbuck and Moshe Farjoun © 2005, Blackwell Publishing Ltd.

Accident Prevention Analysis Guide

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I. INTRODUCTION

"Our national pastime of baseball differs from the society that spawned it in one crucial way: The box score of every baseball game from the Little League to the Major League, consists of three tallies: runs, hits, and errors. Errors are not desirable, of course, but every one understands that they are unavoidable. Errors are inherent in baseball, as they are in medicine, business, science, law, love, and life. In the final analysis, the test of a nation's character, and of an individual's integrity, does not depend on being error free. It depends on what we do after making the error" [*]

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Most employees involved in a serious accident or near miss genuinely want to share what they believe really happened. They feel everyone knows the outcome but not why the decisions and actions made sense at the time. Generally employees want to own their decisions and almost all want to turn the accident into something positive.

Unfortunately we have provided our employees with powerful incentives to <u>not</u> openly or frankly share their understanding of events. Our history justifies the belief that if our employees disclose their decisions and actions (their mistakes?) they will be disciplined, or embarrassed, or otherwise blamed for the accident. Incorporating *just culture* and *storytelling* into the accident investigation process provides both the security and the opportunity for participants to openly disclose what they experienced and what they were thinking, and why that seemed reasonable to them at the time.

A *foundational principle* of high-reliability organizing is a commitment to continuous learning. Learning from success is important but learning from failure is crucial. A key trait of high reliability organizations is a *preoccupation with failure*. Rarely do we experience a serious nonrandom unintended outcome. But when this does happen, the occurrence provides tangible evidence that there are risks we have not correctly understood or managed. There may be flaws in the organization of our work. Because the events are rare, the insights they provide into organizational deviances[†] are also rare and thus enormously valuable. Fidelity to our values demands we treat accidents and near misses as precious learning opportunities and exploit their full value and potential as lessons to both leadership and employees.

[*] *Mistakes Were Made (but not by me): Why We Justify Foolish Beliefs, Bad Decisions, and Hurtful Acts*, by Carol Tavris & Elliot Aronson © 2007 Harcourt Books.

[†] The word *deviance is* not intended to be derogatory. It stems from the body of literature on Organizational Accidents that explain how bureaucracies invariably, over time *deviate* from their own principles and values through the incremental and subtle compromises made to safety due to factors inherent to the organization's purpose and mission.

An Accident Prevention Analysis (APA) is a formal process appropriate for investigation and analysis of an accident, serious accident or serious near-miss[*]. The APA process meets the accident investigation procedural and documentation requirements of Executive Order 12196, OSHA's accident investigation regulations (29 CFR 1960.29) and internal policies of the Forest Service (FSM 6731 & FSH 6709.12).

There are two key features of an APA that are unique among investigation processes:

1. APAs are conducted under the ethical blanket of a just culture[†]. This grants employees a safe and formal way to disclose their errors; and their values that guide their behaviors. A Just Culture recognizes that individuals must be held accountable for reckless behavior, but also recognizes that management should be held accountable for implementing a reliable operating system, managing human reliability, and for supporting a reporting, flexible, and learning culture. Just Culture is about exchanging retributive justice for distributive justice. It is about applying accountability to the most effective source for system safety.
2 APAs Feature a story. The accident narrative section is supplanted by a factual story of the accident using professional storytelling techniques to maximize widespread organizational learning, sharing and teaching of values.

There are two basic goals of the Accident Prevention Analysis report. First is the somewhat simplistic of task of describing factually what happened. This is important on many levels but the APA team's task is to specifically illuminate signals of predictability (if any) that were present before the accident, so that others in similar future situations could recognize signals and treat them as a warning of elevated risks or perhaps a warning of an underestimated risk. For example, the Elkhorn II Escaped Fire Report drew attention to the fact the beetle infested pinyon stands can appear normal and healthy and have average foliar moisture but the coating of pitch on branches and trunks caused by the beetles creates highly flammable conditions. In another example, the Indians Fire APA report warns firefighters that large plume vortices can create hurricane force winds along the fireline.

"If it's predicable, it's preventable"
~ Gordon Graham[‡]

The second basic goal of the APA report is to uncover the social, cultural and organizational conditions that shaped human performance and enabled the accident. The energy of an APA is devoted to understanding why the decisions and actions of the people involved in the accident made sense to them up until the time of the accident. Appreciating how those involved in the accident made sense of their environment and then chose the actions they did, enables meaningful human factors analysis.

The APA is predicated on the assumption that our employees do not intend for accidents to happen. Therefore, if the perceptions, interpretations, decisions and actions leading up to an accident made sense to qualified *normal* employees, then other employees could make exactly the same decisions with exactly

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[*] The definition of *accident, serious accident* and a *serious near-miss* varies and is not defined by OSHA or within the Forest Service directive system. For the purposes of this guide, these terms are used interchangeably and refer to any event that had, *or could have had*, consequences so serious as warranting by policy, or ethical concern for human safety, the need to thoroughly determine and analyze the causes of the event so that correction and mitigation can be implemented as quickly as possible. These events may or may not require immediate notification of OSHA under 29 CFR 1960. 29, and may include an event where person(s) could have been fatally injured but escaped death either through luck, unusual skill or physical ability or successful use of emergency personal protective equipment such as a fire shelter.

[†] Terms and concepts such as Just Culture, Active and Latent Conditions, Human Error, At-Risk Behavior, Procedural Rule and Storytelling are explained in Reference Glossary, Section VI, and in reference articles included in the Appendix.

[‡] See : http://www.gordongraham.com

the same, or worse, outcomes. Note that the focus is on the combination of **conditions** which contributed to, or supported the decisions made, which ultimately resulted in an undesired outcome. This includes the various human performance shaping factors that led to an inaccurate perception or an inaccurate understanding of the risks - that in hindsight, we now know were present. To summarize, the focus on conditions answers:

Why did the accident happen?

By focusing on workplace conditions and on human performance shaping factors; and not on the individual we can focus on the crucial accident prevention question:

Was the accident enabled by latent organizational conditions that could enable a subsequent accident?

All of the recommendations in an APA will exclusively address factors or conditions which remain resident and are likely to enable a subsequent accident.

~ POST SCRIPT TO THE INTRODUCTION

THE MEANING OF SAFETY

Over the past decade, initiatives such as Doctrine, Risk Management, System Safety, Just Culture and Resilience Engineering, and even the APA process itself have expanded our agency's understanding of the meaning of safety. A deeper understanding of safety is essential to being comfortable with the APA process and thus the need for this post script.

The traditional view of safety has been that management is responsible, through engineering and iteration, to design the *safe* workplace. This view holds that accidents happen because employees helplessly and invariably introduce unreliability into an otherwise safe environment or system. The consequence of this paradigm is that accidents are *caused* by employees either making mistakes or, by compromising workplace rules designed to assure safe and error free performance.

Traditionally, unintended outcomes other that "acts of God", were presumed to be an employee's *fault*. In other words - systems were safe and people were unsafe.

This paradigm has itself generated unintended outcomes; such as:

- opportunities to learn from serious accidents have been compromised or lost by the quick, convenient and practically meaningless conclusion in the investigation report of "human error";
- employees fear disclosing their errors because (ethically or not) their errors will be labeled as a causal factor;
- so many rules have been generated to control employee behavior that in aggregate they are reducing employee reliability;
- our cultural and organizational meaning of the word "safe" has come to mean an end-state of full compliance with rules and adherence to precautionary mitigations.

No problem can be solved from the same consciousness that created it.
~ Albert Einstein

In 2006 the Forest Service Foundational Doctrine was signed by the Chief of the Forest Service. Under this leadership direction, organizational reliability and resilience is proactively managed through alignment with principles. Doctrine clearly asserts that safety is about managing risks and not about managing compliance with rules. Through this lens, *safety* is **not** viewed as an *end state*. Safety cannot

be a status because risks are not static (especially in the wildland environment) and there is always some level of risk associated with any activity. In contrast, under doctrine, safety is redefined as the systematic, creative and continuous management of risks.

At the strategic level, systematic risk management is the creative process of identifying hazards, analyzing exposures, calculating frequencies, costs and benefits. Using this information, the accountable official determines the level of allowable risk (i.e., the threshold between unacceptable and acceptable risk) and the mitigations necessary to keep risks below this allowable level. At the operational level, risk management is the process of executing the mitigations intended by management in such a way that they match the reality of real-world / real-time conditions while remaining faithful to the commander's intended level of allowable risk.

Under Doctrine (principle centered management), we approach safety as the process of actively managing risks; not an effort to try and manage outcomes. A concise definition of safety is: ***continuous human creativity in response to ubiquitous risk.*** This emerging paradigm challenges our traditions and is unsettling to many. Moreover, this understanding of the meaning of safety has profound implications for how we should react to accidents. In this view of the world, humans create safety within workplaces that are inherently unsafe; human error is anticipated and ways to reduce the consequences of these errors are constantly sought out.

Accidents (unintended outcomes) should be viewed as tangible evidence that *we* ("we" as a agency or culture) may not understand the risks we ask our employees to face and *we* probably don't understand how our employees are managing the necessary tradeoffs between safety and production / protection and expediency in accomplishing the mission. The long range goal of the APA process is to enhance our understanding of risk and to daylight the gap between risk management as imagined by administrators and risk management as actually performed by operators.

There is a final point about safety, human nature and the APA process that is necessary for this introduction. The APA process does not overlook the fact that all humans – to varying degrees – are hardwired to tolerate and even *enjoy* some level of risk. We all take unnecessary risks for a multitude of psychological reasons and *rationalized* benefits. Some of us have a comparatively high tolerance for risk and actively seek out situations for the sake of risk alone. We hunt and fish and backpack in wilderness; we ride motorcycles, snowmobiles and ATVs; we drive on icy roads to ski or snowboard down black diamond slopes; we hang-glide off cliffs and jump out of airplanes and ride rollercoasters. The iconic Paul Gleason – who arguably has done more for firefighter safety than anyone in the history of wildland firefighting – was an avid rock climber and he had the scars, broken bones and stories of near-death experiences to show for it. The list of unnecessary risks we willingly expose ourselves to (and frequently teach our children to enjoy with us) makes it clear there is something much stronger than the rationality of safety and security that drives human behavior.

The APA process recognizes that all humans will intentionally, take or accept unnecessary risk. Sometimes, good and well intended employees accept unnecessary risks because they sincerely believe it is in the best interest of the government (ex: driving fast to get to a fire) and sometime they take on these risks for the fun of it (ex: driving fast because its fun to drive fast). Sometimes good and well intended employees accept unnecessary risks because the situation enables them to rationalize both the fun and the best interest of the government (ex: driving fast because it is fun and we are en-route to a fire). In the real world, such "errors" are complex, nuanced, and situational and are ultimately only "settled" through the biases of the person charged to decide how the errors shall be disciplined.[*]

[*] *Eve and the Serpent: A Rational Choice to Err,* by Sidney W.A. Dekker – A paper published in the Journal of Religion and Health, October 2007 © Blanton-Peale Institute 2007

Through our traditional paradigm of safety, the notion of *intentional* unnecessary risk-taking is depreciated and goes unstated unless it crosses the arbitrary bounds of gross or criminal recklessness. This is unfortunate because intentional risk taking, even for sake of risk itself, is not unusual or anomalous, and it certainly should not be unexpected behavior. The point is that intentionally accepting unnecessary risks is a salient human factor. Further, the more times that unnecessary risk-taking happens without adverse consequences, the less "risky" the behavior actually seems, and a new norm becomes established. The emphasis on a Just Culture in the APA process is because all human factors must be acknowledged and they should be open for fair consideration and analysis in any accident investigation. If our employees involved in an accident feel that intentional unnecessary risk-taking was okay, it may be much more important (especially to the organization, safety managers, administrators, and system designers) to know why they feel it was okay than it is to try to discipline that feeling out of them. This is the high value of the dialogue enabled by a Just Culture. Often we find that what seemed "unnecessary" to management; seemed "reasonable" to the employee. The ultimate dilemma of a Just Culture is that, ***"Management needs to know what is actually going on – but management cannot accept everything that is going on."***[*]

In summary, the APA process is designed around the human factors *fact*; that humans interpret risks and make decisions based on an array of dynamic conditions – among the most influential are: social/cultural pressures of the workplace and the employee's past training/experience (vis-à-vis, recognition primed decision making). Importantly, both of these conditions are quite clearly under the authority and/or capability of the agency to manage and control. The learning and just culture focus of the APA process also enables and encourages employees to share their individual values of tolerance and acceptability of risk.

> *"Human error is not the cause of failure. It is the effect, or symptom, of deeper trouble.*
>
> *Human error is not random. It is systematically connected to features of people's tools, tasks and operating environment.*
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> *Human error is not the conclusion of an investigation - it is the starting point."*[†]

[*] Sidney Dekker, Presentation given at a Just Culture and Resilience Workshop, April 8th 2009, Washington D.C.
[†] *The Field Guide to Understanding Human Error* – Ch 2, by Sidney Dekker, © 2006, Ashgate Publishing Company.

II. POST EVENT GUIDANCE - A STEP BY STEP PROCESS

"Tactical catastrophes are never the outcome of a single poor decision. Small compromises incrementally close off options until a commander is forced into actions he would never choose freely."[*]

STEP 1. PERSONAL NOTE TAKING.
Following any serious incident, near-miss or accident, the Agency Administrator should immediately provide the people involved with or witness to the accident with a note pad, pencil and a quiet room. Respectfully, with compassion and sensitivity, the Administrator should request them to individually and separately take time to write some notes *to themselves* regarding what they perceived were significant events, observations and decisions. Obviously the administrator should be sensitive to the welfare of people who may have experienced great trauma; but for the sake of accuracy, the sooner personal note taking occurs - the better. The individuals should be asked to write their notes in a bulleted fashion to the extent possible and to avoid analysis and interpretation of events that seem not to make sense. Encourage the individuals to place observations in a chronological order. Suggest to the individuals that they try to recall smells such as sweat, sage, smoke, manure, grass, etc., as olfactory clues often stimulate the recollection of images and sequences before memory denies or manipulates them out of existence. People should be encouraged to talk about what was on their minds before and during relevant events. For example, "I found I was constantly annoyed by how dusty it was" or, "I was feeling a little worried the eggs that morning were bad."

Personal note-taking needs to occur as rapidly as possible after the event for two primary reasons: first, because human memory quickly begins to obscure details of events that do not seem to make sense within the context of the outcome. Second, when one person's recollection of the accident sequence is later contrasted with another person's version, both versions tend to blend and the differences between the recollections tend to either blend together or become exaggerated. To the extent possible, this individual note-taking step should occur before employees discuss the accident with other employees or undergo critical incident stress debriefing/defusing.

If the determination is made to investigate the accident using the Serious Accident Investigation process, these notes will be helpful to the individuals when writing their witness statements. If the accident is investigated with an APA Team, the notes will be used exclusively for and by the individuals that wrote them to help themselves recall events during discussion with the review team members.

Accident Prevention Analysis Teams do not collect or request written witness statements.

Any photographs or video taken that could be useful in reconstructing the accident should be collected and the photographer should be asked to log where and when each photograph was taken.

If the accident involved a burnover or a shelter deployment there are specific considerations the Agency Administrator and APA team need to consider to ensure the wildland fire personal protective equipment functioned as designed. See Appendix G.

[*] *One Bullet Away –The Making of a Marine Officer*, by Nathaniel Flick © 2005 Houghton Mifflin Co.

STEP 2. COMPOSITION OF THE ACCIDENT PREVENTION ANALYSIS TEAM.
If an APA process is appropriate, the Agency Administrator should form an APA Team in consultation with their regional safety officer and/or fire and aviation risk management specialist. Depending upon the complexity of the accident, a team as small as two people or a much larger team composed of technical specialists and trained accident investigators could be formed. Consider the following positions for a fully developed APA team.

Team Leader. A team leader is necessary regardless of the complexity of the event as this person is delegated the authority to manage the analysis, expend funds and is accountable for the timeliness and accuracy of the report. There are no set qualifications for a team leader however it is recommended they be a well respected line officer from outside the region where the accident occurred.

Chief Investigator. This position will almost always be needed on higher-complexity reviews. The person should be experienced and competent in evidence collection, reflective listening interview techniques, accident sequence re-creation and documentation management. Most importantly this person should have a solid understanding of just culture, human factors analysis and the APA process. The Chief Investigator should not have any administrative ties or social relationships with anyone involved in the accident.

Peers. The type of employees directly involved in the accident should be represented by a team member with intimate knowledge of the duties and skills necessary to serve in a similar job title or position as well as understand the cultural pressures these employees face on the job. For example if a smokejumper was involved in an accident, a smokejumper should be on the APA team either as a technical specialist or in another standard team position.

Functional Area Expert. This person has expertise in all aspects of the activity surrounding the accident. For example, if the accident occurred involved a wildland fire engine, the team membership should be composed of one or more persons with an expert knowledge of fireline leadership, suppression strategies, training, operations and fireline safety.

Safety Manager. This position should be filled if it is anticipated that the team will need to be advised on matters relating to OSHA or agency specific occupational safety related issues.

Union Representation. If the accident occurred on a unit represented by a labor union or employees involved are represented by a union, the team should include union representation.

Technical Specialists. These positions are filled as needed and as dictated by the nature and complexity of the event being investigated. 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. A documentation specialist is often essential for any analysis lasting more than a few days. It is recommended the chief investigator advise the team leader of the technical specialist(s) needed for a competent and timely analysis. In particular the chief investigator should anticipate the need for:

- GIS skills to produce quality maps and displays;
- Logistical skills to secure meeting rooms, lodging, printers, faxes, etc.;
- Public affairs skills to handle high external or political interests;
- Meteorology and Fire Behavior Analyst skills to reconstruct weather, fuel conditions, and fire progression preceding a wildland fire related accident.
- Equipment Specialist expertise from the Missoula Technology & Development Center to analyze the performance of Personal Protective Equipment.

Additional considerations for APA Team membership include:

- Detachment from the event. None of the team members should be from the same unit where the accident occurred, nor should any of the members of the team have a social or close working relationship with any of the individuals directly involved in the accident. To the extent possible, the team should meet and set up their base of operations away from the offices of the unit involved in the incident.
- Solid writing skills. At least one member of the team must have the ability to create the factual story of the accident and write the story in such a way as to take maximum advantage of its learning potential for the greater organization.
- Outside perspective. Whenever possible, team composition should be interagency in nature to capture an outsider's view of organizational faults.
- Strong interpersonal and interview skills. Those team members selected to conduct interviews must have strong skills in both empathic listening and interview techniques. Interviewers that appear condescending or offer corrective advice will quickly lose the confidence of the person being interviewed and jeopardize the outcome. See also Appendix B.
- An understanding of Just Culture, Human Factors and Organization Accidents. Team members should have read and understood the reference materials in Appendix E. of this guide.
- Integrity. ALL team members should have a reputation for personal and professional integrity and proven experience in dealing with confidential materials.

STEP 3. DEVELOP AND ESTABLISH A CLEAR UNDERSTANDING OF THE ANALYSIS GOALS AND OBJECTIVES.

Upon arrival to the host unit, the APA Team should in-brief first with the Agency Administrator and then with individuals involved in the accident. It is critical that all involved personnel have a basic understanding of the purpose and intent of an APA and how it differs from a Serious Accident Investigation, an Administrative Investigation or an Occupational Safety and Health Administration Investigation. Specifically, individuals should be briefed on the concepts of a Just Culture and given assurance that no agency administered administrative punitive actions will result from information directly gathered by the APA Team.[*] .If the Agency Administrator believes an employee involved with the accident acted with a reckless and willful disregard for human safety and/or obvious criminal actions, he or she should request an appropriate type of Administrative Investigation.

Emphasize during the in-briefings that the focus of the APA is on what needs to be changed in the organization, in our culture, and in our doctrine. The people at the forefront of the accident are presumed victims of upstream faults, and likely the organization's failure to design and implement a safe operating system and indoctrinate employees to perceive, interpret and then manage risk appropriately aligned with organizational values. In an APA, the accident is viewed as a warning or signal of latent pathogens within the organization. Information gathered is strictly used to enhance the reliability of the organization and the employees within the organization and for no other purposes. Through the frank and honest disclosure of errors and mistakes, the team can learn where the organization is vulnerable to normal human fallibility and can make recommendations for effective risk management corrections. Also, with frank and honest disclosures, the team can recreate the story of the accident participants in a way that resonates with their peers across the agency.

[*] The assurance of no administrative action should be stated in the delegation to the APA Team Leader.

And finally, emphasize in the in-briefings, that the Team shall respect the confidentiality of the process. The promise of no administrative punitive actions is not the same as privileged testimony because an important product of the APA is to openly display the factual story of the accident. If an employee has information that they feel is too embarrassing to be displayed in the factual story, but important for the team to know, they will be offered the opportunity to discuss the information privately with one of the team members. Also, unless the agency with jurisdiction has the authority to grant privileged[*] statements to witnesses, all persons involved must be advised that APA Team members could be compelled to testify regarding their knowledge of the accident in criminal or civil litigation.

The Agency Administrator should compose a delegation of authority to the APA Team Leader. An example of delegation can be found in Appendix F.

It must be clear to the agency administrator that while APA Teams operate under the delegated authority of an Agency Administrator, the team will pursue organizational issues that may not reflect positively on the agency or the unit where the accident occurred. In contrast to a Serious Accident Investigation Team, an APA team is more autonomous. Also, because the process is a *safety* investigation, not an *administrative* investigation, the team shall not betray the confidentiality of the employees involved unless they are ordered to do so through the judicial system.

Team members should be instructed to be meticulous in preserving the confidentiality of the process. Only the final accepted version of the report should be stored on fixed storage media or transmitted by email. Pre-finalized materials may be faxed with appropriate caution to ensure the intended recipient is available and ready to securely retrieve the fax.

Regularly scheduled conversations should occur between the Team leader and the agency official who authorized the investigation. The purpose of these discussions is two-fold: first, to keep the agency official updated on the Team's progress, and second to ensure that the investigation is meeting the needs of the sponsoring official. These conversations are not an opportunity for the agency official to "steer" the analysis in a particular direction; rather, they are opportunities to ensure that the needs of the Administrator are being met and that the APA Team is answering all of the "how" and "why" questions that triggered the review in the first place.

STEP 4. INTERVIEWS AND ACCIDENT RECONSTRUCTION.

Conducting interviews appropriately is crucial to the APA. Interviews should occur as soon after the accident as possible especially for accident victims that are showing a strong emotional response to the event. The Team Leader should select interviewers based on their experience, skills in empathic listening, interviewing and interpersonal communications. The conduct and intent of interviews conducted in an APA is significantly different than in other investigative processes. Interviewers must understand and be skilled in applying the concepts and philosophy of APA interviews as displayed in Appendix B.

APA teams do not use depositions, record interviews or request witness statements. These traditional accident investigation tools conflict with establishing trust and will interfere with obtaining frank disclosure of mistakes, at-risk behaviors and reflections of personal values.

The Team Leader or Chief Investigator should consider using a team of two interviewers for critical witnesses. Employees tangential to the accident may be interviewed in groups. One-on-one interviews

[*] A "Privileged" statement or testimony is one in which the agency agrees shall not be disclosed under any circumstances including criminal prosecutions or civil proceedings. Privilege is generally not useful in APAs as the purpose of the review is organizational learning which necessitates a full, open and truthful disclosure of all relevant information.

may be needed due to logistical or time constraints. The Chief Investigator should be aware of the danger of the interviewer injecting personal biases when the interview is one-on-one and manage these risks.

Less experienced interviewers will struggle with looking beyond the proximal cause of the accident and all interviewers will face hindsight bias. Interviewers should try to remember the objective of the interviewer is to be able to describe how the employee developed his/her understanding of the situation and then made sense of their choices. A skilled interviewer should be able to explain how the employee's past experience, values, social/cultural pressures and their physical and mental condition influenced their perception and interpretation of the risk that they faced.

Before interviews begin the chief investigator should refresh interviewers of the guidance contained in Appendix B and remind them to collect quotes for the report that will be displayed under the headings:
"What the Peers Learned for Themselves"; and,
"What the Peers Believe Management Should Learn From Their Experience"

The exact process of reconstructing the accident will vary depending upon the size of the team and the complexity of the accident but the team should be meeting together frequently (for example: a morning strategy session and an evening debriefing session). It is often helpful to post a series of flipchart pages together and construct a chronology or time line of events that led up to the accident. Timestamps from photographs and dispatch logs are helpful to verify critical times.

At the conclusion of the accident reconstruction the team should be in consensus of what happened and when it happened. Why it happened and especially why decisions made sense at the time will be a team product and the focus of the next step.

STEP 5. THE LESSONS LEARNED ANALYSIS.

THE LESSONS LEARNED ANALYSIS IS THE HEART OF THE APA PROCESS. THE END-STATE OF THE THIS STEP IS TO IDENTIFY WHAT WE AS INDIVIDUALS AND WE AS AN ORGANIZATION SHOULD LEARN FROM THE ACCIDENT. THIS STEP IS A METHODICAL PROCESS INTENDED TO IDENTIFY, VALIDATE AND ANALYZE THE KEY FACTORS THAT SHAPED EMPLOYEE PERFORMANCE AND THUS CONTRIBUTED TO AN INACCURATE PERCEPTION OR AN INACCURATE UNDERSTANDING OF THE RISKS - THAT IN HINDSIGHT, WE NOW KNOW WERE PRESENT.

After reconstructing the accident and all the relevant facts of the accident, the APA team completes a "Lessons Learned Analysis". The purpose of this effort is to display the team's analysis of what the organization (and all employees therein) should learn from the accident.

The APA process is predicated on the presumption that if *normal* well-intended employees can get themselves or others into serious trouble then there are likely human performance shaping factors latent within the system that will again conspire against our employees and yield another accident. Recall the introduction to this guide; *If the perceptions, interpretations, decisions and actions leading up to an accident made sense to qualified employees, then other employees could be expected to make exactly the same decisions with exactly the same, or worse, outcomes.* Therefore in the APA process, *"causal factors"* per se, are exclusively the underlying organizational and cultural and individual human performance shaping **conditions** (the upstream factors) that normalized deviance[*] or encouraged at-risk behaviors or enabled simple and inevitable human errors to produce an unintended outcome.

The preceding paragraph is a major philosophical shift from traditional accident investigation training. Understanding the philosophy behind APAs and intent of the Lesson Learned Analysis process has been

[*] See definitions of Normalization of Deviance and Practical Drift in the Glossary

one of the greatest challenges to APA teams over the past several years. The difficulty may be because team members fall back to their earlier view of *safety as a condition*. To overcome this challenge, consider the following as the *new rules* - that is, the **key points of understanding** for a team going through a Lesson Learned Analysis process:

- Risk is everywhere and in everything.
- Safety is the active, creative and continuous process of reducing the likelihood and/or the severity of harm, through controls, avoidances, barriers, redundancies, procedures, mindfulness enhancements, etc. The objective of safety is to avoid all unnecessary risks and manage residual risks to a level that is acceptable to the leader and the employee.
- While safety is an essential business practice, our agency does not exist to be safe or to protect our employees. We exist to accomplish a tax payer funded mission as efficiently as possible knowing that many things we choose to do are inherently hazardous (for example, firefighting and driving).
- Essentially every safety precaution carries some level of cost to production and/or compromise to efficiency. One of the most obvious is the cost of training. Employees at all levels (administrators, safety advisors, system designers and front line employees) are continuously and often subconsciously, estimating, balancing, managing and accepting these subtle and nuanced tradeoffs between safety and production.
- Many risks are routine; mitigations or avoidances are straightforward and can be fairly simple. Many risks however are ephemeral and emerge from the complex interactions of random or sporadic events. These irregular and unexampled threats are managed through employee ingenuity with skills that are often systematically connected to the culture and the values of the workplace and the especially the resources the organization devotes to engineering resilience. [*]
- How employees (at any level) perceive, anticipate, interpret and react to any type of risk is systematically connected to *conditions* associated with the design, systems, features, and culture of the workplace. Effectively all of these conditions (these human performance shaping factors) are under some degree of control of the organization. Again, one of the most obvious is training.
- For the purposes of preventing the next accident, the Lesson Learned Analysis process seeks to analyze the *conditions under the agencies control* (e.g., doctrine, training, supervision, experience, peer pressure, social and cultural factors, workload, tools, etc.) that shaped employee performance and thus created a response to risk that we do not want to repeat.

"We cannot change the human condition -
but we can change the conditions humans work under." [†]

Even with the above understanding, APA teams invariably struggle with hindsight bias and myopic attention to the active mistakes of the employees directly involved with the accident. The team should actively resist the virtually instinctive inclination to label human errors and at-risk behaviors as the *causes* of the accident. Instead, the cause of the accident is better characterized as the combination of conditions which contributed to or supported the decisions made, which ultimately resulted in an undesired outcome. This includes the various human performance shaping factors that led to an inaccurate perception or an inaccurate understanding of the risks - that in hindsight, we now know were present.

The team must keep focused that the ultimate purpose of the APA is the increased resilience of the organization and not the correction of the individual. Attributing human error as the *cause* of the accident is ultimately sacrificing organizational resilience for the convenience, ease and satisfaction of retribution (i.e., scapegoating) the error-doer.

[*] See *Risk + barriers = Safety?* a journal article by Erik Hollnagle in Safety Science p. 221-229, vol. 46, 2008.
[†] James Reason - multiple sources, ex: British Medical Journal 200; 320: 768-770

Teams must also guard against making counterfactual arguments, as in "if this person had done X, then the outcome would have been Y and the accident would not have occurred". These types of arguments are ultimately useless, in that they do not relate to the reality of what actually happened. The analysis is only useful to the extent it results in learning why people did what they actually did (why it made sense to them at the time), rather than why they did not do something that, in hindsight, others think they should have.[*]

The reason human error and at-risk behaviors are identified and analyzed in this process is because they are the key signals and clues to understanding human performance with respect to the risks that were perceived, the competing goals or commitments, and how our employees made sense of the risks and the tradeoffs between safety and production. Once the team understands how the accident participants made sense of their environment, the team should contrast that understanding with how administrators thought employees would (or should) make sense of that environment. Exploring the gap between work as imagined by administrators - and work as actually done in the real world, can illuminate substantial and critical organizational weaknesses.

With respect to human error (mistakes, simple mental errors, lapses, etc), the Lesson Learned Analysis process focuses on those conditions that enable inevitable human error to precipitate a significant unintended outcome. Typically the "*cause"* or the condition of concern to the team is a procedure or system design that relies too heavily on error free performance. The emphasis is not to absolve individuals of their culpability. Rather the APA philosophy is that humans are fallible and this fallibility must be accounted for in system design. For example, all employees will occasionally make simple arithmetic errors. In the case of a helicopter load calculation (calculating the weight of the cargo) a simple error could result in a catastrophic accident. Recognizing the inevitability of arithmetic errors, the agency is responsible to design a system with checks and redundancies such that flight safety is not dependent upon a single employee's flawless mathematical performance.

Deficiencies in physical ability, knowledge, skill or leadership competencies may also be uncovered and considered key findings or risk factors. In these situations the focus of the team is not on the individual but on the system (the organizational conditions) that enabled under-qualified or under-capable employees to be in critical positions.

With respect to at-risk behaviors, they ultimately arise from a misalignment between the organization's expressed values and the values of the employees, in particular regarding the discernment of risk and the perception of the authority to mitigate risk. At-risk behaviors are frequently the result of poorly designed procedures and rules; managerial objectives that conflict with procedural rules; a failure of management to manage culture (especially routine or condoned at-risk behaviors); other supervisory failures; and a failure of the organization to ensure employees appropriately perceive, understand and have the authority to mitigate risk. All of these are human performance shaping factors that are of interest to the Lessons Learned Analysis process.

The credibility of the analysis and the report depends on full disclosure of all the proximal active human errors. However, the team must be careful in writing the Lessons Learned Analysis to ensure, to the extent possible, that the employees involved in the accident are not embarrassed (and thus socially punished) for admitting their mistakes. As long as the employees were not willfully and recklessly disregarding human safety, their at-risk behaviors and other active failures leading up to the accident must have seemed reasonable (if not justifiable) at the time. The report must show from the employee's perspective how they *reasonably* contributed to the accident, and thus, retain the focus of accountability upon the conditions under the control of the organization. It also allows the Lessons Learned Analysis to

[*] *The Field Guide to Understanding Human Error* – Ch 5, by Sidney Dekker, © 2006, Ashgate Publishing Company.

describe *why* the involved personnel did what they did, which provides a significant benefit to others seeking to avoid the same outcomes.

The recommended procedure for conducting the Lessons Learned Analysis is as follows:

1. Gather the team together in a secure, private, meeting room.

2. Extract from notes, interviews, the chronology and the accident reconstruction, all of the key findings as to risk. These findings are the key interpretations, beliefs, mistakes, lapses, misperceptions, decisions, actions and behaviors that directly contributed (i.e., proximal) to the accident.

3. Next the team should discuss and come to a consensus on the conditions (i.e., the human performance shaping factors) that made the findings reasonable, natural, or expectable in the context of the situation leading up to the accident. The team should keep asking *why* until they reach the level of sensemaking that was shared by those directly involved in the accident. [*] For each key finding, the team should deliberate upon:

   Why it made sense at the time and leading up to the accident -
   - to see things the way they were seen;
   - to expect what was expected;
   - to believe the risks were one way, when in hindsight we know they were another way;
   - to forgo an available hazard mitigation;
   - to shortcut typical procedure;
   - to accept a risk that in hindsight seems unreasonable to have accepted;
   - to ignore a risk that in hindsight seems so obvious.

   The answer to these *why* questions will lead to identifying the workplace conditions and performance shaping factors that are of interest to the team. Findings related to simple lapses or mental mistakes are also important to address because they may reveal that the organization is unacceptably vulnerable to an accident because of an over reliance on flawless human performance.

4. The last effort of the Lessons Learned Analysis process is to deliberate and determine which of the conditions identified above are resident in the organization and remain pathological. In other words, the team should determine which among these conditions identified above could contribute to another accident with such likelihood and/or effect that the organization should change that condition. These conditions will be carried forward to Step 7 and become the object of the recommendations. Obviously every organization and organism exists and coexists with a variety of pathogens. They are ubiquitous. The team's challenge however, is to extract from the accident story those conditions that expose our employees to an unacceptable level of risk and should (in the team's opinion) be worth the cost to the organization to change them.

It is recommended that the team read the Indians, Cascade, Chalk or Angora APAs as an example of a Lesson Learned Analysis. Please note however, these reports labeled *organizational conditions* as "causal factors." Beginning in 2009, the author of this APA guide recommend avoiding or minimizing the term *cause* or *causal* in the report altogether and instead referring simply to "conditions".

For high profile investigations, it is very desirable to include a human factors specialist or a psychologist on the team even if just to assist in the Lessons Learned Analysis deliberations. These specialists can offer unique insight into human performance, attention and mental errors that untrained persons would

[*] The team should not hesitate to call persons previously interviewed to clarify perceptions and resolve conflicting memories and understandings.

not recognize. Human factors expertise, if available, should also be employed for summarizing the Lessons Learned Analysis - Step 6.

STEP 6. THE SUMMARY.

This section is a summary of the findings and conditions that supported assumptions, decisions, and actions taken including those conditions that contributed to an inaccurate perception or an inaccurate understanding of the risks our employees faced. Consider creating a comprehensive timeline of the accident that illustrates how the proximal causes (active failures) of the accident can be traced back to the upstream conditions and human performance issues that were illuminated in the Lessons Learned Analysis (Step 5).

STEP 7. THE RECOMMENDATIONS.

Following the summary, an APA team should develop recommendations to address the conditions that degrade organizational resiliency. APA recommendations exclusively focus on the organization, operational system design, culture, training, supervision, structure, standards, procedural rules, etc., that if changed, would reduce the likelihood of a similar accident. Typically the recommendations reinforce that managing human reliability not just the employee's responsibility, is an inherent responsibility of the organization. The recommendations section is a separate and confidential section of the report delivered separately from the APA report to the Agency Administrator. The Administrator may choose to include some or all of the recommendations into final published report so that the larger agency and community can see a direct and tangible benefit from this accident.

~ ***EXAMPLE:*** The following is an example of a simplistic APA that shows how the report links the Lessons Learned, the Lessons Learned Analysis, the Summary and the Recommendation:

~

The story describes a serious accident that occurred when an employee was driving a vehicle with an under-inflated tire that became overheated and blew-out, creating a loss of vehicle control. Under the ethical blanket of a Just Culture, the employee *safely* admits that, although he had been told periodically to check the tire pressure, he never checks tire pressures.

A Lesson Learned by the peer for himself could be:

> "Under inflated tires can be deadly! I will, from now on, regularly check the air pressure in my tires."

A Lesson Learned by the peer that s/he thinks management should learn from this accident could be:

> "Some employees do not know how dangerous it can be to drive with an under-inflated tire. I had to learn the hard way. Management should ensure we all understand the importance of checking tire pressures."

A Lessons Learned Analysis provided by the review team might be:

Key Issues, Decisions, and Behaviors:

- The employee rarely, if ever, checks the tire pressure on feet vehicles.
- The employee drove a vehicle that had a seriously under-inflated tire.

Additional Findings Related to Risk:

- The unit recently began using pooled vehicles rather than assigning vehicles to individuals.
- Employees interviewed reported that maintenance deficiencies including: over and under-inflated tires, low oil levels, bad shocks, worn wiper blades, etc. is now common

among pooled vehicles. Unit vehicles are considered to be and accepted as low reliability.
- Rules such as requiring all employees to perform all maintenance checks on vehicles are not enforced.
- Most of the employees on the unit believe that routine maintenance on vehicles is everyone's responsibility but not *any one's* responsibility.

Conditions and/or Factors Shaping Employee Performance:
Management and employees have become accustomed to, that is they have normalized and accepted, driving vehicles with inadequate maintenance. There is a general and pervasive sense that vehicle maintenance is nobody's responsibility and that the related safety concerns are minimal. While the policy exists in writing, there is no administrative or social pressure to maintain vehicles.

The Summary section could state:
A workplace condition that directly supported this accident is that the unit has no process in place to enforce (or provide the social or administrative incentives to comply) with the existing rules requiring regular and routine maintenance of all vehicles.

Through the lens of hindsight we know that *not* checking tire pressure regularly is a very risky behavior. In a culture where this behavior is normal, the risks associated with the behavior become normalized. Once normalized, the risks are no longer managed; instead, they become routine, ignored or treated as unavoidable risks.

A Recommendation given to the Agency Administrator could be:
The unit should establish, continually update, and enforce a process to assure regular maintenance and servicing has been performed.

The *fact* that every driver has a procedural (and perhaps legal) responsibility to ensure the vehicle is in safe operating condition can become *practically* irrelevant in an environment where this rule is not enforced (or at least is commonly violated with no adverse consequences). The rule is an ineffective rule. In this example, the active (failure to check air pressure) was a *predictable* at-risk behavior. Correcting only the employee by blaming him or her for the accident would miss correcting the more important *organizational conditions* (performance shaping) factors. The Lessons Learned Analysis in this example disclosed a cultural, normalization of deviance and the recommendations address this to build organizational defenses against future and predictable human error.

STEP 8. TELLING THE STORY OF THE PEERS, SPECIALIST INPUT AND VALIDATION.

A central feature of the APA report is the *story of the accident*. In an APA, a factual narrative is replaced by a factual story. The purpose and intent is to exploit the power of storytelling to affect organizational learning.

Effective storytelling transmits values and triggers the reader into a state of active thinking.[*] A good story has a beginning, middle and an end. There is a story line that includes the intended goals of the main players, an event that reverses their fortunes and then an experience of recovery, reflection and learning. It is written in plain language and leads the reader through the sequence of events as they occurred.

[*] Reference *the Leader's guide to Storytelling: Mastering the Art and Discipline of Business Narrative*, by Stephen Denning, © 2005 John Wiley & Sons Inc. .

In an APA the story will present the accident in the way it was seen and understood by those involved leading up to the event. To the extent possible the story should not be written from an outsider's perspective but from the perspective of the peers most directly involved in the accident. The story is not written to persuade, but rather to reveal to readers the reality and truth of what actually happened from the perspective of those involved and accurately conveys what the peers understood, believed, and experienced.

The goal of the APA story is to tell truthfully what happened from the perspective of the employees most directly involved in the accident in a way that effectively shares their experience with their peers across the agency. If the story is properly written it will show how the decisions of these employees made sense within their social and cultural context based upon information known to them at the time, given the human factors involved.

It is inevitable in any complex event that every person involved will have a different perspective of what happened and why. Memory is *reconstructive*[*] and strongly influenced by the degree of trauma involved, self image, intrinsic security and values. Incorporating multiple perspectives (in essence multiple reconstructions of reality) is a difficult balance; between the need to enhance completeness and accuracy and the need to create a coherent and readable story. In complex cases consider a disclaimer to note that the story told is that of those directly involved inside the event at the *sharp end of the spear* and may not fully represent the recollection of those outside this group. Readers may need to be reminded that the purpose of the story is to show how the persons directly involved (e.g., the accident "victims") perceived what they did; chose the actions they chose; and experienced the unintended consequences that evolved. . In other words, how did they make sense of the situation at the time?

If written well, the story may be read by hundreds if not thousands of employees who will vicariously experience the accident and gain the same experiential reference (*a vivid lesson learned*). Likewise, managers reading the story are shown what organizational failure looks like through the lens of employees most affected and should react with a desire to change these conditions.

Key individuals involved with the accident should have <u>one</u> opportunity to hear the story and they should be requested to correct or clarify important details as they listen. In advance of this reading advise the key individuals to bring their personal notes or logs for their use during the reading. Anticipate that this reading could reveal events or even *facts* that will surprise these key individuals. Some discrepancies in memories and sensemaking are inevitable and most are not worth the time and energy to resolve. Significant discrepancies however, may have to be resolved and may necessitate re-interviews and confronting individuals on discrepant recollections. If important discrepancies cannot be reconciled consider the disclaimer noted above or alternatively stating the alternate recollections in an appendix to the report.

Give people a fact or an idea and you enlighten their minds;
tell them a story and you touch their souls. ~ Hasidic proverb

~ STORY VALIDATION: The story should be read (verbally – no paper copies) to the accident "victims" first, then later to key witnesses and administrators. Reading the story to these key individuals substantially improves the credibility of the report. In some situations it may be appropriate to bring all persons involved in the incident together for story validation in a facilitated group setting. Such a meeting should be preceded by a discussion on just culture and the philosophy of the APA process. The accident participants should also know there is no guarantee that the story or any other part of the analysis will change as a result of this validation process; this is a judgment made by the Analysis team.

[*] *Mistakes Were Made (but not by me): Why We Justify Foolish Beliefs, Bad Decisions, and Hurtful Acts.* by Carol Tavris & Elliot Aronson © 2007 Harcourt Books.

Importantly, the reader should expect that every individual involved in the accident has their own personal understanding of what happened. Individual perspectives may differ substantially. Subconsciously people tend to exaggerate their own level of significance to any event. Since the APA's story is about those at the sharp-end of the accident, others involved may feel slighted when they learn that *their* story is not being told. The APA team should also expect that memories change over time as people naturally tend to rationalize and justify their behaviors. And finally, this reading and validation meeting must not be viewed as an opportunity for managers and supervisors involved in the accident to get their perspectives injected into the story. Past experiences in story validation demonstrate that people that work together often (e.g., Incident Management Team members) tend to strongly support one another and create a group interpretation of history.

STEP 9. REPORT REVIEW, PRESENTATION AND APPROVAL.

Upon completion, the APA report is presented to the delegating Agency Administrator and other officials chosen by the Administrator, for comments, recommendations and final approval. The review team leader should have developed a good working relationship with the Agency Administrator and should be sensitive to his or her needs and concerns throughout the process. Nevertheless, an APA is an administratively confidential process, and thus, more independent of oversight and control than a Serious Accident Investigation. Also, the APA Team must have an appropriate level of autonomy to protect the Team's capability to identify learning opportunities and necessary changes to the organization itself which may, in some cases, *not* reflect favorably on those in charge of the organization. The APA Team Leader and the Agency Administrator should work together to resolve any items of dispute pertaining to the report. It is important to distribute the report as quickly as possible, but the integrity of the process and the quality of the report are preeminent. In the unlikely event of an irreconcilable dispute between the Agency Administrator and the APA Team Leader leading to a refusal to approve and publish the report promptly, the Agency Administrator should request mediation from the next higher level of the agency. If the delegating Agency Administrator is the head of the agency (for example, the Chief of the Forest Service) the Administrator shall request mediation from a Senior Executive Service employee acceptable to both the Team Leader and the Agency Administrator.

- There is no Board of Review process in an APA.
- Action on recommendations is discussed in Step 12.

The Agency Administrator retains the authority to request the report be vetted by legal council, Freedom of Information Act or Claims and Privacy Act specialists. It should be unusual for significant changes to result from this vetting but the team shall comply with these requests to neutralize unnecessary legal or political damage to the agency. If other agencies were involved in the accident (e.g., cooperator personnel were injured or were witnesses), coordination should occur with those agencies prior to the release of the report.

Specialist reports such as a Human Factors Specialist Report, a Fire Behavior Analyst's Report or a report on the performance personal protective equipment are helpful and should be included as appropriate. Since virtually every significant accidents or near miss involves a variety of human errors, the Human Factors analysis is often a key part of the report. Every attempt should be made to conduct such an analysis and include it in the report.

STEP 10. DISSEMINATE REPORT.

The APA Report should be posted on websites that will maximize organizational learning. Wildland fire related APA Reports should be submitted for posting on the Wildland Fire Lessons Learned website. It is important to disseminate the report as quickly as possible for lessons learned accident prevention purposes.

STEP 11. DEPOSITION OF NON-EVIDENTIARY MATERIALS:
After the report is accepted, the chief investigator should collect and secure all flash drives, notes of interviews, team deliberations and draft reports. Material evidence such as photographs, personal protective equipment used, audio files and transcripts of radio communications, law enforcement reports, etc shall be collected, cataloged, sealed and given to the Agency Administrator for secure storage. The Agency Administrator should consult with their appropriate legal council or records manager on retention of these records and material evidence.

STEP 12. ACTION ON RECOMMENDATIONS.
If the recommendations contained in the report are relevant only to the local unit, or region, the Agency Administrator should assemble a team to evaluate the recommendations and develop an accident prevention action plan as appropriate. This team should complete the accident prevention plan as soon as possible, generally within a few weeks of report completion. If the recommendations address higher-level organizational issues, the Agency Administrator should forward the recommendations along with the report to the appropriate national level agency lead, with a request to form a national level review board to analyze the report and develop a national action plan addressing relevant recommendations. Certain APA Team members may be called upon to defend the report to the review board.

STEP 13. IMPROVING THE INVESTIGATION AND APA PROCESS.
About a month after the report is completed, the APA Team should reconvene with relevant agency administrators and conduct an after action review. Results of this review should be forwarded to the Forest Service Risk Management Officer with the goal of improving the APA process.

STEP 14. LOCAL UNIT FOLLOW-UP.
The clear bias of the APA process is towards excavating and exposing organizational and cultural deficiencies. Given this, personnel on the local unit where the event occurred may believe individual performance issues such as active failures of leadership or a clear rule violation were ignored, overlooked or trivialized in the report. <u>These beliefs can exacerbate existing interpersonal conflicts</u>. Agency Administrators should be aware of this and help employees admit mistakes, take ownership in their past decisions, share the lessons learned *and then move on*. In incidences of high trauma Administrator should consider a facilitated dialogue session or a High Reliability Organizing Workshop with those evolved, to work though the cultural and organizational challenges that the accident and the analysis brought to light.

And finally, Agency Administrator must ensure employees are not persecuted as a result of their admissions to the APA Team. However, the Administrator may provide employees with focused opportunities (for example, details, trainings, trainee assignments etc.) to enhance their skills, <u>provided it is clear to the employees that these are voluntary opportunities</u>. In other words, "punishment by training" must be avoided.

III. DISCLOSURE OF SERIOUS CRIMES OR A RECKLESS AND WILLFUL DISREGARD FOR HUMAN SAFETY.

Though likely very rare, during the APA process it may be discovered that an employee acted with a reckless and willful disregard for human safety or willfully committed a serious criminal act that cannot be overlooked. Just culture is not a blameless culture and certain acts clearly require aggressive correction. This rare event is one reason APA Team members need a solid understanding of Just Culture, and they must also be competent in explaining this concept to both the Agency Administrator and the peers involved in the accident.

Consistent with the ethics of a Just Culture, employees must know that reckless and willful disregard for human safety or an act that is criminal should (ethically and legally) lead to administrative or legal actions. For example if it is discovered that a crew directly involved in the accident was under the influence of illegal drugs, the APA Team Leader should suspend the APA process and advise the Agency Administrator that the APA cannot continue and some other process such as a law enforcement or administrative investigation may be appropriate. The APA Team Leader should release all material evidence, but confidential notes of interviews shall be returned to the person giving the interview. The APA Team Leader should merely state that the Accident Prevention Analysis is being terminated and that there may be cause to initiate an administrative investigation. If the crew above was tangential to the accident, it may be possible to separate the crew's actions from the rest of the APA process and still produce a quality report. In this case, an Administrative Investigation could occur separately and independently.

Intentional violation of a rule or procedure does not necessarily equal reckless or willful disregard for human safety! Self-reporting of intentional procedural rule violations is one of the most valuable features of an APA. Most often, a procedural rule violation falls within the category of normal and predictable human behavior and is better defined in behavior based safety literature as *at-risk behavior* (see the Just Culture in Safety Investigations, Appendix C). It may be beneficial to know *why* an employee intentionally violated a workplace rule, but it cannot automatically be assumed that such behavior is reckless. When at-risk behavior is disclosed, it can yield enormously valuable insight into management's need to manage employee reliability, management's normalization of deviance and management's need to teach employees how to perceive, understand and mitigate risk aligned with expressed corporate values. Disclosure of at-risk behavior can also reveal procedural rules that interfere with safe operations. Understanding the *expectation and the intention* of the employee is critical to discriminate between a procedural rule violation and reckless and willful disregard for human safety. Admissions of procedural rule violation must be protected under the ethical blanket of a Just Culture throughout the APA process.

IV. COOPERATION WITH OTHER INVESTIGATIONS.

APAs are independent and confidential. If other investigations are occurring at the same time as an APA, the Agency Administrator must ensure the APA Team is insulated from interference. For example, if Compliance Officers from the Occupational Safety and Health Administration[*], or Investigators from the Office of Inspector General wish to conduct an accident or a safety investigation, they should be supported by and assisted by the Agency Administrator, but generally should have no contact with the APA Team, have no access to any of the team's notes and should not be permitted to participate in interviews. Material evidence such as photographs, transcripts of dispatch logs, law enforcement reports, personal protective equipment, etc, must be shared with the OSHA and/or OIG officers. Written documents and photographs should be duplicated whenever possible so that other investigating authorities may retain a separate copy.

[*] See 29 CFR 1960.29 for OSHA guidance on accident investigations.

V. SUGGESTED REPORT OUTLINE

1. **Executive Summary**
   A one to two page summary of the accident with highlights of Lessons Learned and conditions which contributed to or supported the decisions made at the time.

2. **Introduction**
   Overview of the accident setting, the process used to investigate the accident; team membership

3. **Narrative of the Accident**
   The factual story of the accident using the techniques of professional storytelling.

4. **Lessons Learned by the Peers**
   A compilation of the views expressed by those involved in the accident related to what they learned for themselves and what they believe the organization should learn from their experience.

5. **Lessons Learned Analysis** (by the review team)
   A listing and brief explanation of the findings as to risk, key issues, decisions, interpretations and behaviors associated with the accident. This is followed by brief explanation of team's determination of cause. That is, the conditions and employee performance shaping factors that the team has determined may lead to a subsequent accident.

6. **Summary (optional)**
   A summary of the analysis and a listing of the salient conditions that contributed to an inaccurate perception or an inaccurate understanding of the risks - that in hindsight, we now know were present.

7. **Appendix**
   An appendix of relevant specialist reports such as a fire shelter performance report, engineer's structural analysis, Fire Behavior Analysis Report, Weather Reports, etc.

8. **Glossary**
   A glossary of terms used in the report that may be unfamiliar to the general public.

9. **Recommendations**
   A listing of reasonable courses of action based on the identified casual factors, which the APA team reasons will reduce the probability and/or severity of, future accidents. The Agency Administrator may choose to refrain from including the recommendations in the final report.

10. **Team Participants**
    A list of the APA team members that are responsible for the report.

VI. REFERENCE GLOSSARY

ACTIVE FAILURES AND LATENT CONDITIONS:

Within the context of an accident, an active failure is an obvious or generally evident error committed by a person that is in direct contact with a larger system. The term *Active Failure* is use synonymously with *Active Error*. For example, driving too fast for conditions, or storing gasoline in an unsafe container, intentionally or not, represent active failures that may result in an accident. Active failures are simplistically referred to as a root cause in typical accident investigations. Latent Conditions are the organizational and cultural practices and patterns that if changed would either prevent the active failure from occurring or would have prevented the active failure from having an adverse outcome. For example, in the case of driving too fast for conditions, a competent analysis of latent conditions would look hard at driver training, certifications and cultural incentives for fast (or safe) driving. Latent conditions are only "failures" per se because in hindsight they *failed* the organization by being part of the conditions that enabled the accident.

A medical metaphor suggested by the US Department of Health & Human Services, Agency for Healthcare Research and Quality is illuminating (see www.ahrq.gov). Active failures are referred to as being at the *sharp end* of the scalpel. In the event of a medical mistake, the errors at this end are noticed first - such as cutting the wrong artery. Latent errors are those at the *blunt end* referring to the training, licensing, motivations, and cultural influences of the surgeon handling the scalpel. Correcting active failures improves the safety of one surgeon or perhaps one particular medical procedure. When latent "failures" are mitigated, however, the broader system is made more reliable.

AT-RISK BEHAVIOR:

At-risk behavior, also called compliance drift, is unintentional risk taking. The employee knows, at least at the subconscious level, that he or she is not in full compliance with a procedure or rule. The employee is not recklessly and intentionally disregarding human safety because there is no intent to increase the risk and no expectation that harm will result. If the at-risk behavior contributes directly to an accident the behavior becomes an active failure. The outcome of the at-risk behavior is irrelevant to determining the seriousness of the procedural rule violation.

At-risk behavior is intimately connected with the perception of risk. The most common causes of at-risk behavior are: 1) it is done to increase efficiency and/or improve performance; and, 2) violating the procedure is a condoned practice within the employee's culture. Other common reasons for at-risk behavior include: not knowing or understanding the procedural rule; the circumstances made procedural rule compliance appear unreasonable at the time; adherence to the procedural rule appeared to conflict with or compromise the intent of the employee's supervisor; there were conflicting rules; other agency values conflicted with a rule; and the employee believed that the consequences of failing to comply with a procedural rule were insignificant within the context of the situation.

Managing at-risk behavior involves assessing the efficacy of the procedural rule, assessing the effectiveness with which the rule was communicated to employees, assessing the incentives to employees for violating the procedural rule and assessing the effectiveness of the organization to help employees make safe behavioral decisions. If the procedural rule is a valid and propitious rule, management is responsible for managing employee reliability by providing the appropriate training, incentives for compliance and ensuring employees correctly understand the risks of deviation.

Outside of an APA, management may choose, appropriately, to punish repetitive at-risk behavior as one of many tools available to manage human reliability. Inside of an APA however, at-risk behavior is protected as the more important goal is to learn from it.

HUMAN ERROR:

Human error is an inadvertent action. Human error can take a variety of forms including mistakes, such as a calculation error or a perceptual error. Human error also includes memory lapses, unskilled work practices and miscommunications.

Managing human error may involve redesigning the training and proficiency testing process and also may involve addressing system design faults (e.g., lack of redundancy) that enable a human error to result in unreasonable risk to the safety of the operating system. If a system is designed such that it relies on error-free performance in order to function safely, then there is a problem with system design since human error is a normal part of the human condition. Human error immediately preceding an accident is virtually always an active failure.

JUST CULTURE:

Just Culture is a human performance management system that recognizes that regardless of how highly trained or well intended, humans will inevitably make mistakes; and, even the most conscientious professionals will drift from full compliance with rules and protocols. Thus accountability for risk management is directed upward to the cultural and organizational levels where system design and values should be managed. In a fully developed just culture, management accepts responsibility to design and implement safe operating systems and the responsibility to manage employee reliability. The ethic of a Just Culture recognizes that managing safe systems and safe performance is a dynamic and continual process fundamentally dependent on the organization sustaining a reporting and learning culture. See also, the reference article - Appendix C, and www.justculture.org.

NORMALIZATION OF DEVIANCE & PRACTICAL DRIFT:

A phenomenon endemic to complex organizations where there is gradual shift in risk perception and acceptance at various bureaucratic levels. Aberrant risky behavior and easing of risk mitigation protocols become incrementally more acceptable and institutionalized, especially in the absence of catastrophic accidents. The subtle and gradual nature of the shift precludes recognition or awareness until it eventually precipitates a catastrophe. Practical Drift refers to the tendency of local units of operation to similarly deviate from safe systems due to local operational pressures as well as pressures and expectations applied by the larger organization. These deviations from intentional risk management represent latent pathogens within the organization or culture.

PROCEDURAL RULE

For both safety and efficiency, we strive to ensure our employees are both technically and tactically proficient in executing the intent of their supervisors and agency values. They achieve their reliability through the training, experience, rules and supervisory coaching provided by the agency. The term "procedural rule" in the context of this document includes three broad categories of behavioral compliance with the intent of the supervisor or the agency: 1). Absolute rules that are not subject to employee discretion, such as wearing seatbelts when driving or carrying a fire shelter on the fireline. 2). Standard procedures for operations which generally but may not always apply, such as having a map of one's working area, attending *and listening* to morning project briefing, or knowing the weather forecast for the day. 3). The third category is value-based; it is perceiving, understanding and effectively managing risk consistent with the values of the agency. This category has enormous importance to the safe implementation of Doctrine. A supervisor who is strongly bigoted, for example, may comply with all rules and procedures, but unless or until their values are aligned with the agency, their nuanced behaviors pose unjustifiable risks to the agency. Integrity,

duty, honesty and self sacrifice are high values espoused by the agency and *compliance* with these values is essential to principle centered management. Managing firefighter fatigue is another excellent example and directly related to an alignment of values of a fire crew leader with the values of the organization. With significant financial incentives to maximize overtime, a crew leader must have the integrity, at times, to overcome these incentives and make a stand-down decision that goes beyond just-the-rules to mitigate fatigue concerns.

RECKLESS AND WILLFUL DISREGARD FOR HUMAN SAFETY:

For the purposes of an APA, this behavior is both willful and intentional. As with at-risk behavior, the outcome is not important; the intent and the expectation of outcome is important. A reckless and willful disregard for human safety means the employee made a conscious choice to create or accept a substantial risk knowing that harm to the employee or to others could reasonably be expected to follow as a result.

(FACTUAL) STORY TELLING:

Stories, in the context of an APA, should not be confused with fiction or an enhancement of facts. In an APA, the narrative is a factual account of what actually occurred as told from the perspective of those most directly affected by the accident. Because the document is designed to be a learning tool, the narrative is written exploiting the experiential power of storytelling. Human rationality and decision making is dominated by heuristics. Humans make sense of and remember "facts" by creating mental stories that give the facts context and an emotional attachment. Consequently, storytelling is widely recognized by leading educators as the most effective tool for teaching human ~ environmental interactions and effecting cultural change. [*]

[*] For further information on human rationality and storytelling see the reference materials listed in Appendix and, *Heuristics and Biases – The Psychology of Intuitive Judgment*, by Gilovich, Griffin & Kahneman, © 2003 Cambridge Univ. Press.

APPENDIXES:

A. **DETERMINING WHAT TYPE OF INVESTIGATION OR REVIEW IS APPROPRIATE**

B. **CONDUCTING INTERVIEWS IN AN ACCIDENT PREVENTION ANALYSIS**

C. **ACCIDENT PREVENTION ANALYSIS - INTENT & PURPOSE**

D. **JUST CULTURE IN SAFETY INVESTIGATIONS**

E. **VIEWING ACCIDENTS AS WARNINGS OF ORGANIZATIONAL PATHOGENS**
DRIFT AND DEVIANCE IN THE FOREST SERVICE

F. **REFERENCE MATERIALS FOR ACCIDENT PREVENTION ANALYSIS TEAMS**

G. **EXAMPLE DELEGATION OF AUTHORITY**

APPENDIX A.

DETERMINING WHAT TYPE OF INVESTIGATION OR REVIEW IS APPROPRIATE.

Two processes currently exist for responding to *serious* events that have unintended outcomes. These are the Serious Accident Investigation (SAI) and the Accident Prevention Analysis (APA) processes. The intent and purpose should drive the manager's decision as to which type of investigation process is appropriate. A Serious Accident Investigation is effective in disclosing the active failures directly related to an accident. Serious Accident Investigation procedures also may help defend the agency as they are focused on the failure of employees to comply with established procedures ("*…the causes of most accidents or incidents are a result of failures to observe established policies, procedures and controls…*"[*]). In contrast, APAs are focused on disclosing the latent cultural and organizational conditions that shaped human performance and will lead to another similar accident. While APAs do not overlook active failures, the premise of an APA is that human error is not only inevitable; it is also largely predicable and therefore manageable. Effective accident prevention is when the organization is accountable for providing normal and fallible employees a safe working environment. Importantly, the APA bias is that the specific accident itself is relatively insignificant compared to what the organization needs to learn from it. A Facilitated Lessons Learned Analysis is effective in developing a culture of learning throughout the organization particularly at the local unit. Our need to evolve to a high reliability organization requires a learning culture that is infused from the highest to the lowest levels of the organization. For graphical help in choosing a learning review or investigation process see the Decision Aid immediately following this appendix.

Determining if an APA is the appropriate investigative tool requires the Agency Administrator to gather sufficient information to answer five questions:

A. **Is a Serious Accident Investigation required by policy?** Forest Service policy requires a Chief's level investigation of an accident with one or more fatalities. The Chief's Office may choose to investigate any other accident. Generally these types of accidents will have such serious political consequences that a Serious Accident Investigation process is better suited to the event. (Reference FSM 6731.1 and FSH 6709.12 section 34.1). Implementing an APA does not change the accident reporting requirements (Reference FSM 6732 and local policies - if applicable). If the accident is interagency in nature (e.g., involving personnel from more than one agency or jurisdiction), there may be investigative requirements stipulated in the authorizing Memorandum of Understanding between the agencies. The APA is authorized by all signatories to the Interagency Standards for Fire and Aviation Operations (the Red Book).

B. **Is litigation against employees likely as a result of the accident?** If the answer to this question is yes, the Agency Administrator should consider a confidential administrative investigation and/or a traditional SAI. A just culture based investigation is inappropriate under the threat of a criminal or civil action.

[*] Accident Investigation Guide, section 1.1 Introduction, 2005 edition, USDA Forest Service Publication 0567-2806-MTDC. Ted Putnam, retired USFS fire entrapment expert and Psychologist (personal correspondence) noted this simplistic statement fails to take into account that managers have prescribed rules that firefighters cannot follow which then serve to focus blame on firefighters when accidents occur. The Ten Standard Fire Orders are the prime example.

C. **Is there evidence that an act of reckless and willful disregard for human safety directly contributed to the accident?** If the answer to this question is yes, the Administrator should consider an Administrative Investigation and a concurrent Serious Accident Investigation if appropriate. If the APA Team uncovers an act of reckless and willful disregard for human safety[*], the team may not be able to sustain the trust and confidence of other accident participants knowing that disciplinary action is likely. Moreover, the value of an APA is to hold the agency accountable for designing safe systems and managing human reliability. The employee, *not the agency*, is accountable for reckless and willful disregard for human safety. If this behavior is believed to have directly contributed to the accident then an APA is likely a wasted effort.

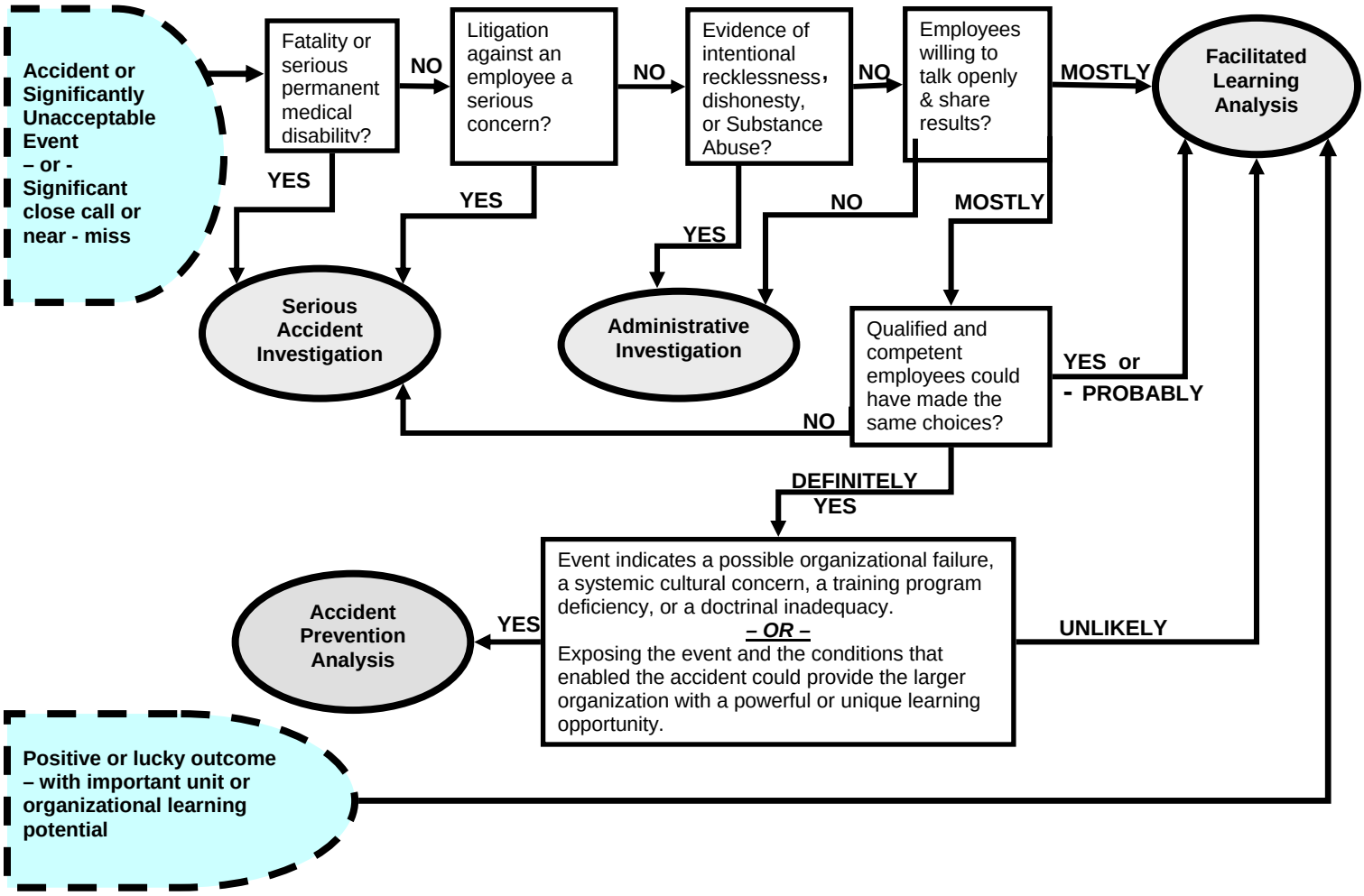
D. **Is the Agency Administrator committed to disseminating the Lessons Learned?** The answer to this question must be yes. This is a critical consideration for the Agency Administrator, because this review process will likely illuminate organizational failures to provide a safe workplace resilient to human error. There is also an explicit agreement between the Agency Administrator and the accident victims or witnesses that no adverse administrative actions will be taken against victims or witnesses who tell the truth after an accident. Some information in the report may be uncomfortable and even embarrassing to management officials. Importantly, to effect positive change, the lessons learned by management officials (just like with the employees involved in the accident) must be disseminated so that other managers can learn without having to experience a similar event.

E. **Is the accident an organizational accident?** Accidents involving competent, well-motivated employees are those strongly indicative of an organizational accident. The more surprised administrators are by the accident the more the accident tends to be organizational in nature. If the answer is yes, an APA will be more effective in preventing future accidents because an APA is designed to uncover organizational causes.

[*] A *reckless and willful disregard for human safety* is conduct that is intentional, unjustifiable and occurred with the foreknowledge that the conduct was likely to result in serious harm, death or injury to a human. See also the reference glossary.

DECISION AID FOR AGENCY ADMINISTRATORS FOR CHOOSING A POST EVENT INVESTIGATIVE / ANALYSIS PROCESS

The following 'Decision Aid', provided by the USFS Risk Management Council, is designed to assist Agency Administrators when choosing a post event investigation / learning analysis option.



Appendix B

THE CONDUCT OF INTERVIEWS IN AN ACCIDENT PREVENTION ANALYSIS

The primary goal of any post accident interview is to determine what actually happened. APA interviews have a second goal that is just as important: to understand how and why the decisions leading up to the accident made sense at the time. The emphasis is not to disclose where employees made mistakes, or to identify what should have been done, but to disclose why their actions seemed reasonable at the time. Traditional investigations analyze facts and about 80% of the time concludes that human error was the cause. An APA has a profoundly different view of errors and is much more consistent with the human factors approach to accident investigations. The APA process is predicated on the following view of human error:

- Human Error and At-Risk Behavior are not viewed as causal factors. These are viewed as consequences of organizational and cultural influences.
- Human Error and At-Risk Behavior are not random. They are systematically connected to features of workplace culture, organization, operating environment, and system design.
- Human Error and At-Risk Behavior is not the conclusions of an APA; they are the starting points. [*]

Hindsight bias is the chief enemy of an interviewer trying to obtain honest and thorough information from a person involved in an accident. Interviewers must keep in mind that they have virtually unlimited access to information and facts that the witness did not know and often could not have known. It is natural human behavior for interviewers to inject their reconstructed situational awareness into the words (if not the memory) of the witness. Interviewers must be vigilantly aware of how crucially important their foreknowledge of the outcome is during the interview.

Interviewers may never be able to completely overcome hindsight bias but they can mitigate many of the negative effects using the following threefold approach: [†]

1.) The interviewer should make every attempt to genuinely trust the witness.

2.) As deeply as possible, the interviewer needs to achieve the same limited perspective as the witness had leading up to the accident. If successful the interviewer will share a sense of surprise at the outcome just as the witness must have at the time of the accident.

3.) The APA team must avoid using counterfactual expressions or even thinking in terms of counterfactuals. Counterfactuals are realities that did not happen but (with perfect hindsight) could have made a difference. The goal of the investigation is to find out why things happened the way they did. What the team members might think *should have happened* will only degrade this goal. Examples of counterfactuals include: "If only the employee had…" "The crew leader failed to…" "The supervisor should have…" etcetera. When counterfactuals come to mind team members should try to overcome their effect by telling themselves that even if the counterfactual had happened, the outcome might still have been the same. [‡]

Interviewers should appreciate that the witnesses are also afflicted by hindsight bias. To a large extent human memory will connect images and facts to build a coherent mental story that makes sense. This

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[*] Paraphrased from *The Field Guide to Understanding Human Error* by Sidney Dekker, © 2006, Ashgate Publishing Company. All APA interviewers are strongly encouraged to read this text.

[†] ibid.

[‡] Comment to this guide provided by, Mike Johns, Assistant U.S. Attorney & Senior Litigation Counsel

mental sense-making occurs continuously for days or weeks after a traumatic accident and can innocently and honestly invent non-existent facts. A recommended solution is to help the witness recreate his or her story and keep them focused on telling the story only from their perspective.

Throughout the investigative process the team should be performing a Substitution Test – this is asking: *could another employee (or supervisor of the activity) meeting the agency's minimum competency standards make the same decisions and have the same (or worse) outcome?* If the answer to this question is "yes" then it is likely a similar or worse accident will occur again unless the latent conditions are identified and mitigated.

An equal challenge to the distortions caused by hindsight bias are the distortions created by human memory. With no dishonesty or deceit intended, witnesses will create missing pieces of information to make sense of events that did not make sense to them at the time and they will connect unrelated events together if it helps to reconcile their actions with the "facts" revealed in the outcome. The anxiety caused by confusion (of not knowing), especially if personal harm or danger was involved can create overwhelming psychological stress. This stress can lead to a mental paralysis that could be deadly in a time pressured life threatening situation. Panic can be fatal. The human mind (in rough terms) has evolved to overcome this paralysis through furious pattern matching. The accuracy of the pattern matching is far less important to one's mental well being (and survival) than the relieving and calming sense of conclusiveness and sensemaking. When our ancestors were being chased across the Fertile Crescent by a saber tooth tiger a *quick decision* beat a *well thought out decision* every time. Humans instinctively, intuitively and subconsciously perform creative sensemaking in response to the anxiety and stress of confusion. [*]

> *"The error of imaginary causes… To trace something back to something known is alleviating, soothing, gratifying and gives moreover a feeling of power. Danger, disquiet, anxiety attend the unknown – the first instinct is to eliminate these distressing states."* [†]

The setting for the interviews is very important. The location should be free of distractions, comfortable (water, coffee, etc.), private and with no time limit. If the person being interviewed uses tobacco, the interviewer should offer a comfortable outside location where the employee can smoke or chew. The interviewer must empathetically listen, never offering advice or correction. At the beginning of the interview, the interviewer should ensure that the employee knows of the counseling services offered by the agency and offer to personally facilitate obtaining those services for the employee if wanted. The interviewer should advise the employee he or she will be given an opportunity to hear and correct the report before it is presented to the agency and further distributed.

At the start of the interview, the interviewer should remind the employee that no agency initiated administrative punitive actions will result from the information gathered in the interview, but that a separate administrative investigation could be initiated if someone intentionally put someone in harm's way, knowing that there was no justification for the risk. Also, unless the agency with jurisdiction has the authority to grant privileged statements to witnesses, all persons involved must be advised that APA Team members could be compelled to testify regarding their knowledge of the accident in criminal or civil litigation. Simply stated, the APA process grants employees protection from administrative actions but not immunity from criminal prosecution.

[*] See also *Human Error* – by James Reason © 2000 Cambridge University Press; esp. ch 2 & 3
[†] Fredrick Nietzsche – *Twilight of the Idols* (circa 1888)

The tone of the interview is that the agency must learn where its employees are vulnerable to systemic flaws, "practical drift, [*]" human error and at-risk behavior and cannot learn this if it punishes people who self-report. In other words, the agency's need to know what happened outweighs any need to punish. The interviewer should emphasize to the employee that the lessons he or she learned need to be learned by others, so that they don't have to learn it through another accident. Truthful and complete information may save a fellow employee's life. Following the interview, the interviewer must exchange telephone numbers with the employee, offering an open-ended opportunity to discuss the event further and a number where the employee can be reached for proof-reading of the report.

In quoting Gary Klein (*Sources of Power – How People Make Decisions* © 1998 MIT Press), Sidney Dekker[†] suggests that a debriefing interview should follow this order:

1. First have participants tell the story from their point of view, without presenting them with any replays that supposedly "refresh their memory" but would actually distort it;

2. Then tell the story back to them as investigator. This is an investment in common ground, to check whether you understand the story as the participants understood it;

3. If you had not done so already, identify (together with participants) the critical junctures in a sequence of events;

4. Progressively probe and rebuild how the world looked to people on the inside of the situation at each juncture. Here it is appropriate to show a re-play (if available) to fill the gaps that may still exist, or to show the difference between data that were available to people and data that were actually observed by them.

The following are the questions suggested by Klein & Dekker to elicit from the witness perspective how sensemaking developed at <u>critical junctures</u>:

Cues	What were you seeing? What were you focusing on? What were you expecting to happen?
Interpretation	If you had to describe the situation to your colleague at that point, what would you have told them?
Errors	What mistakes (for example in interpretation) were likely at this point?
Previous experience/ knowledge	Were you reminded of any previous experience? Did this situation fit a standard scenario? Were you trained to deal with this situation? Were there any rules that applied clearly here? Did you rely on other sources of knowledge to tell you what to do?

[*] Practical Drift is a term attributed to Scott Snook. It is an organizational dysfunction closely associated with the normalization of deviance but more applicable to the local operational unit. See *Friendly Fire*, by Scott Snook, © 2000 Princeton University Press.

[†] *The Field Guide to Understanding Human Error* – Pg 94-96; by Sidney Dekker, © 2006, Ashgate Publishing Company.

Goals	What goals governed your actions at the time? Were there conflicts or trade-offs to make between goals? Was there time pressure?
Taking action	How did you judge you could influence the course of events? Did you discuss or mentally imagine a number of options or did you know straight away what to do?
Outcome	Did the outcome fit your expectation? Did you have to update your assessment of the situation?

Additional questions may be asked to help the team reconstruct the story and the sequence of the accident as needed. Every scenario is unique and the above suggestions are to be taken as guidelines only. The following is a tool for optional use, duplication and distribution to interviewers:

APA INTERVIEWER'S GUIDE

{DISTRIBUTE TO EACH INTERVIEW TEAM}

You control the environment – comfortable, private, and friendly or *find another place.*

1. Ask witness to tell the story from their point of view. Don't correct.

2. Tell the story back to them to ensure you can make sense of their decisions the same way they made sense of them at the time.

3. Agree with the witness on their perspectives of what the critical junctures were in their story. Probe deeper into these junctures with these questions:
    a. Clues
        i. What were you seeing?
        ii. What were you focusing on?
        iii. What were you expecting to happen?
    b. Interpretation
        i. If you had to describe the situation to your colleague at that point, what would you have told them?
    c. Errors
        i. What mistakes (for example in interpretation) were likely at this point?
    d. Previous Experience
        i. Were you reminded of any previous experience?
        ii. Did this situation fit a standard scenario?
        iii. Were you trained to deal with this situation?
        iv. Were there any rules that applied clearly here?
        v. Did you rely on other sources of knowledge to tell you what to do?
    e. Goals
        i. What goals governed your actions at the time?
        ii. Were there conflicts or trade-offs to make between goals?
        iii. Was there time pressure?
    f. Taking Action
        i. How did you judge you could influence the course of events?
        ii. Did you discuss or mentally imagine a number of options or did you know straight away what to do?
    g. Outcome.
        i. Did the outcome fit your expectation?
        ii. Did you have to update your assessment of the situation?

4. With key witnesses, progressively probe and rebuild how the world looked from their perspective at each juncture. Show the witness pictures, video, maps etc (if available) to fill the gaps that may still exist. Discuss with them the difference between data that were available to people and data that were actually perceived and/or used by them. Encourage them to address what hindsight bias would say was a "loss of situational awareness".

APPENDIX C

JUST CULTURE – EFFECTIVE ACCOUNTABILITY FOR PRINCIPLE-CENTERED MANAGEMENT

Paper submitted to the International Association of Wildland Fire
10th Safety Summit – Phoenix, Arizona.
Steve Holdsambeck
Fire Operations Safety Program Manager, US Forest Service, Intermountain Region
April 22, 2009

"Any safety system depends crucially on the willing participation of the workforce, the people in direct contact with the hazards. To achieve this, it is necessary to engineer a reporting culture – an organizational climate in which people are prepared to report their errors… An effective reporting culture depends, in turn, on how the organization handles blame and punishment…What is needed is a just culture" [*] **~ James Reason**

Abstract:
Recognized by James Reason over 20 years ago as crucial to a safety culture, Just Culture is an intuitively compelling, ethical system of accountability. The old mafia credo, *"Punish one, teach a hundred"* may be reasonably effective in a compliance-based safety program but the ideology will retard, if not destroy, a learning culture. As wildland fire agencies transition to principle-based management, safety and reliability are especially vulnerable unless the organization is committed to learning from mistakes and then exploiting this knowledge through an aggressive risk management system.

A Just Culture is not a 'blameless culture' - as it sometimes maligned. It is more accurately understood as an accountability system that is based on human factors. Just Culture asserts that while it is undeniably necessary to hold employees accountable for their choices, it is essential and "just" to hold management accountable for designing a reliable operating system and for managing employee reliability. Holding management accountable for employee reliability is not shifting the blame from the individual to the organization; rather, is it acting on the knowledge that how our employees perceive, interpret and react to risk is substantially influenced by workplace cultural values and the systems, processes and artifacts of their work environment. All of these influences are conditions over which management has control and therefore legitimate responsibility.

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[*] *Managing the Risks of Organizational Accidents*, p.195 by James Reason © 2006 Ashgate Publishing Ltd.

Why we need a just culture

Principle-based management (or, the fire *doctrine*) introduced by the Forest Service in 2005 is potentially a major advancement with respect to the safety of wildland firefighters and the resilience of the firefighting organization[*]. This management philosophy seeks to guide risk management choices through *fidelity to principles*; while departing from the emphasis on *compliance with rules*. With respect to firefighter safety, the highest *principle* to guide decision making is thorough risk management with the highest *value* being human life. As Principle-based management (hereafter referred to as doctrine) takes hold in the wildland fire culture, decisions should become more risk-based and less rule-based over time. To the extent individual firefighters and their workgroups are able to perceive and interpret real-time risks accurately, risk-based decision making is a much safer system. Risk-based decision making addresses actual and authentic risks while rule-based decision making is driven by rules that were inevitably crafted to respond to risks that may not be fully relevant to a given present situation. The vulnerability of risk-based decision making is that employees may not interpret risks accurately and may not share the administrator's level of risk tolerance. The safety problem under doctrine becomes: *How should leadership ensure the workplace culture and the operational systems support firefighters to accurately interpret risk, and make decisions that are aligned with the principles and values of the agency?*

Before that problem can be addressed however, leadership must know what is actually going on in the operational world of firefighting. That is, how are employees perceiving risks and managing the trade offs between safety and production? And then, manage employee reliability by addressing: what needs to be changed, adjusted, encouraged, stopped and rewarded. In a resilient system, these are continuous and dynamic questions; an answer that fits one situation will not exactly fit the next one. There is never an "end-state" in the realm of safety.

Leadership can only know what is actually going on if there is open and honest reporting especially from the field level firefighters who have the greatest exposure to risk. There is an inherent dilemma to a reporting culture and this is its greatest challenge: *"Management needs to know what is actually going on - but management cannot accept everything that is going on."*[†]

The ideal workplace could be described as:

> A work culture where employees demonstrate their willingness to share their doctrine, their values, behaviors, and their errors, based on the trust that such disclosures are protected from reprisal and confidence that administrators will use this information to improve system design and organizational resilience.

This is the *end-state* of a Just Culture.

The mafia creed ~ punish one - teach a hundred

Cultures that value individualism (such as the United States in general and the wildland fire community in particular) are known to champion and promote holding individuals responsible for outcomes. With perfect hindsight, accident investigators can always locate human errors and at-risk behaviors somewhere in the accident story. By tradition and convenience, those who are found to

[*] See documents at: http://www.fs.fed.us/fire/doctrine/index.html for the background and status of the fire doctrine.

[†] Sidney Dekker, Presentation given at a Just Culture and Resilience workshop, April 8th 2009, Washington, D.C.

have committed these acts (the error-doers[*]) are the persons blamed for the outcome. Because of an unfortunate bleed over from the law enforcement investigation process to safety investigations, the illusory concept of *root cause* establishes that the blame should stop with those error-doers who had the last, best chance to prevent the accident.

Blaming employees who could have, but failed to, prevent an accident has not worked well for the wildland fire community. We have sacrificed a learning culture to a superficially accountable culture. In the wake of an accident, sometimes we punish firefighters, sometimes we don't; but we have consistently found ways to blame them for the accident. Blame is often worse than punishment. Due to privacy rule interpretations often punishments are held confidential. The human *cause* however, is typically published in the accident investigation report. The names may be redacted in the report but in the small and familiar wildland fire community, soon everyone seems to know who lost situational awareness, who ignored the fire order, or who violated a standard procedure. Public blame is powerful and consistently effective in one respect: that is, in suppressing the *disclosure* of behavior considered blameworthy. When we investigate an accident and blame the people who didn't intend for the accident to happen, we need to consider the effect on the thousands of other firefighters who are watching how the agency responds to accidents. In a sense we have designed and implemented a system to prevent the reporting of errors

"every system is perfectly designed to achieve exactly the results it achieves"[†]

The issue facing wildland firefighting becomes - what is more important: knowing how and why employees make mistakes and at-risk behaviors; or, correcting each particular instance of error and at-risk behavior after it has surfaced? A Just Culture's answer to that question is unequivocal. Learning trumps retribution. Aggressive punitive actions remain sensible tools for correcting the reckless, malicious, or dishonest employee or the employee - that after counseling - continues to violate procedural rules. However, programmatic discipline, under the guise of *employee accountability*, is misaligned accountability and a dangerous policy. If we punish the reporting of error we will stop the reporting of error.

"take your pick, you can blame human error or you can try to learn from the failure"[‡]

Over the past two decades, companies in the aviation, energy, and health care fields have been confronted with escalating and sometimes unprecedented liability risks. An accident can result in business being quickly litigated out of existence. This threat has generated a worldwide dialog on the most effective system to manage employee reliability. A quick web search will demonstrate that many health care organizations are implementing Just Culture as a safety system in itself and many aviation organizations are moving towards a version of a Safety Management System that is predicated on Just Culture.[§] Many organizations that manage high-risk operations, such as federal

[*] The term *error-doer* was created to capture the sense that while the people involved in accidents may have made a mistake (an unintentional *error*) their behaviors were nevertheless a result of their own actions (*doer*). The term is also designed to assimilate a degree of the emotional response associated with the term *evil-doer*. As used by US government officials after 9/11, the term evil-doer has come to mean anyone that caused great harm to our society because of their evil. Humans are compelled to punish (exact retributive justice) people that have caused harm - as we innately seem to feel compelled to punish the error-doer.

[†] Quote commonly attributed to Dr. Donald Berwick

[‡] *The Field Guide to Understanding Human Error,* p 4, By Sidney Dekker © 2006 Ashgate Publishing Ltd.

[§] *Safety Management Systems – An FAA Update*, By Keri Lyn Spencer; Nov 2008, available online at www.faa.gov

wildland fire management agencies, are striving towards High Reliability Organizing which holds a learning culture as a foundational value.

Just Culture as a system of accountability has found a special niche in the health care industry with well over a hundred hospitals participating in Just Culture training.[*] One of the incentives for this movement was US congressional attention into a "*conspiracy of silence"* concerning medical mistakes in the late 1990s. While research was showing medical mistakes in the United States were causing three times more fatalities than auto accidents, surveys also showed that self-disclosure of errors by healthcare professionals was occurring in only 2 to 3 percent of known incidents.[†] The incentives to keep quiet after one makes a deadly mistake are especially effective for physicians as there is virtual guarantee of retribution – *virtually every confession results in a malpractice lawsuit*. At the behest of congress Dr. Lucian Leape, Professor at the Harvard School of Public Health investigating the high rate of medical mistake related fatalities testified, "The single greatest impediment to error prevention is that we punish people for making mistakes."[‡]

Forward looking accountability

Sociologists tell us there is something intrinsically and darkly satisfying with retributive justice. The subject line of the email that spread the news of the conviction and death sentence of the arsonist convicted in the Experanza fire through out the Forest Service was titled simply: "Justice Served". Like "revenge" retribution carries with it the comfort of closure and assurance of self innocence. The protection offered by a Just Culture is unacceptable for many and they malign Just Culture as a "blame-free-culture" fearing justice will go un-served. But there are two sides to justice; retributive justice and distributive justice. We need to ask, which side would best serve the goals of a learning culture; not which would make us feel satisfied. In a fully developed Just Culture, management accepts responsibility to design and implement safe operating systems and accepts responsibility to manage employee reliability. With this responsibility follows just accountability. The *justice* of Just Culture is that accountability is not retributive; it is distributive - across all the layers of the organization that bear the responsibility for changing the conditions that enabled the error. It doesn't focus on blaming history; it focuses ensuring the future is better.

The obvious conclusion to the problem identified by Professor Leape is to manage around the facts that humans are inevitably fallible and system reliability is enhanced by knowing everything possible about its vulnerabilities. In the short run it may be uncomfortable; in the long run, the wildland fire community will be much more resilient treating error as a precious opportunity to learn about systemic risks. For organizational learning to be sustained leadership must protect and cherish those *error-doers* that are willing to raise their hand, stand up and say, "I made a mistake and here's what I've learned…"

A story from the health care industry, shared by Dr. David Marx at a recent Just Culture Workshop,[§] serves to illustrate the point:

> Due to a crisis in an emergency room a nurse takes a blood sample from two different patients at the same sitting and at the same time (violating a procedural rule) and accidentally mislabels each sample with the wrong patient name. After a period of time,

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[*] Ref: www.justculture.org

[†] *Patient Safety and the Just Culture, A Primer for Health Care Executives* available on line at: http://www.usuhs.mil/cerps/documents/ps_justculture.pdf

[‡] Leape LL. Testimony, United States Congress, House Committee on Veterans' Affairs; Oct 12, 1997

[§] From a presentation on Just Culture, Public Training workshop hosted by Outcome Engineering LLC Dec 5th 2006, Dallas Texas

the nurse realizes his mistake when he learns that the two patients he sampled at the same time both received incorrect and opposite diagnoses.

In most healthcare organizations, there are enormous incentives for the nurse to conceal his mistake. This is not entirely unethical. The nurse can remain in good standing with his conscience, concealing the mistake, by self-affirming, *"I'll never do that again."* But more important than the nurse in this example is the health care organization he works for. If the nurse's health care organization clinic had a Just Culture *doctrine*, the nurse could safely disclose his error and management could then determine if there would be value in redesigning the procedures for taking multiple blood samples so that future nurses do not make the same mistake.

With the assurance of justice, workers are socially rewarded for self reporting. The risk management benefits to these organizations are that over time the various artifacts and processes that are vulnerable to human fallibility (both errors and at-risk behaviors) are made apparent to managers. The managers can then exploit this knowledge by reengineering the system (to make it more resilient to humans) prior to subsequent similar events. It is not very effective to hold workers accountable for the past (backward looking accountability); in contrast a Just Culture holds administrators accountable for preventing a future similar accident. This is "*forward looking accountability."*[*]

Human error

Much of the "justice" of a Just Culture is its approach to Human Error. For the purposes of this argument, any behavior that is outside or inconsistent with the intended procedures (or at least those procedures imagined as proper by current leadership) are classified as either *reckless behavior* or *human error.*

Reckless behavior is very rare and generally considered aberrant behavior within the entire workplace culture. Within the paradigm of a Just Culture, reckless behavior on the job should virtually always result in some form of discipline or removal. Reckless behavior is a behavioral choice that an employee makes knowing they will increase risk of harm to a human and there is no reasonable justification for this action.

The classification of behavior labeled "human error" includes the broad category of at-risk behaviors as well as mistakes, lapses, blunders oversights, change blindness, impaired situational awareness, and similar 'goofs' many of which can only be identified in hindsight. There is no pejorative connotation with the label human error. Indeed, through the lens of a Just Culture, failures or accidents virtually always arise because system adjustments are insufficient or inappropriate to cope with normative human error. In a Just culture human error is rarely seen as causal to any accident. At its essence, human error is natural human variability and consequently it is a *human factor.* Managing it becomes an engineering issue, an ergonomic issue, a system issue and principally a management issue. As Professor James Reason is quoted frequently, *"We can't change the human condition, but we can change the conditions under which humans work."* Employing humans to work in a system where their safety depends upon error free performance is at best - irrational, and at worse - unethical.

At-risk behavior is the most important type or subcategory of human error. Much of the attention of a Just Culture is focused on at-risk behaviors. While there are important differences between the constructs of: "routine nonconformance", "practical drift", "normalization of deviance", "pragmatic

[*] The construct of *forward looking* and *backward looking accountability* is developed in *Promoting Patient Safety: an ethical basis for policy deliberation.* By Virginia A. Sharp, The Hastings Center Report, Sept – Oct 2003, www.thehastingscenter.org

fine-tuning" as attributed to Sidney Dekker, Scott Snook, Dianne Vaughan and Starbuck & Milliken, respectively – for the purposes of this argument, they all refer to at-risk behaviors.

At-risk behavior is typically lumped into the statistic of "human error". For example one can easily find statistics showing that 70, 80, or 90% of aviation accidents are the result of human error. Most of what investigators classify as human error is more usefully defined as at-risk behaviors. A key difference between a mistake, a goof, a lapse, etcetera and at-risk behavior is that at-risk behavior involves a deliberate choice, though that choice may be due to a perception error. A practical definition of *at-risk behavior* is given on the www.justculture.org website:

> *"A behavioral choice that increases risk where risk is not recognized, or is mistakenly believed to be justified."*

This definition is simple but it works very well because it is not about compliance to a procedural rule - it's about the perception and interpretation and then the response to risk.

Understanding at-risk behavior is particularly helpful with respect to helping wildland firefighters make safe choices. A wildland firefighter's world is dense with ambiguous situations; *"Operational life contains situations whose subtle and infinite variations will mismatch the exact circumstances of training. It may contain surprises, situations that fall outside of the textbook. Practitioners must be able to apply skills and knowledge acquired through training, to situations that even the trainer was unable to foresee."*[*] A Just Culture, like the fire doctrine, recognizes that practitioners, in our case the wildland firefighter, must improvise as they negotiate between competing goals while facing unexampled situations in an inherently hazardous environment. Indeed, safety is ultimately creative responses to competing goals and indeterminate risks[†]. Often the line between creatively managing goal conflicts in a way that reduces risk (safety) and managing goal conflicts in ways that increase risks (at-risk behaviors) can only be made in hindsight in the wake of an unintended outcome. Hence, there is a crucial need to treat accidents as precious learning opportunities.

In a Just Culture, administrators recognize that at-risk behavior is inevitable at all organizational levels and managing at-risk behavior is just as much an expected duty as managing any other recognized human factor that affects performance and safety. At-risk behavior is often the best and may be the only indicator of a bad system design, or gaps in leadership or supervision. In this sense, knowledge of at-risk behaviors is fundamental to risk management; the more complete the knowledge, the better we can manage the system.

In summary, some at-risk behavior is clearly unwanted behavior. Often at-risk behaviors, wanted or not, are very well motivated and tend to enhance productivity or efficiency at the cost of safety. Often the only difference between workplace innovations that are desirable and at-risk behaviors is that at-risk behaviors fall outside of what administrators and system designers see as the thresholds of *acceptable* risk.

Cognitive dissonance

One of the strengths of a Just Culture is that it helps organizations speak honestly about competing operational goals. For instance, *safe, effective and efficient* are laudable principles, but as operational

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[*] *Crew Resilience and Simulator Training in Aviation*, an article by Sidney Dekker, Nicklas Dahlstrom, Roel van Winsen & Jame M. Nyce, from *Remaining Sensitive to the Possibility of Failure; Resilience Engineering Perspectives* - vol. 1, p. 119 © Erik Hollnagle, Christopher P. Nemeth, Sidney Dekker 2008; Ashgate Publishing Limited

[†] See *The Field Guide to Understanding Human Error*, especially chapter 2, By Sidney Dekker © 2006 Ashgate Publishing Ltd.

goals they are inherently competitive. The more the focus is on one - the more the other two will suffer. A struggle to focus on all three equally would lead to socially intolerable *compromises* to safety. Administrators, Incident Command Teams or leaders at any level that assert a "zero tolerance accidents" are less effective than they could be because they are not working within reality. Wildland fire organizations do not exist solely to be safe. They exist to accomplish other work and that work necessarily entails accepting additional risks and their consequences. Within a Just Culture administrators are ultimately responsible, but employees must participate, in determining how competing goals are balanced and how risks are managed.

To be fair (just), accountability should only follow responsibility. Among many things administrators should take responsibility for:

- ✓ making risk management decisions (the trade-off decisions and the determining the limits of acceptable risk);
- ✓ designing and managing the processes needed to accomplish the work;
- ✓ managing the factors that shape employee performance.

The *factors that shape employee performance* are of course human factors in the broadest sense. These factors include the obvious things such as training, tooling and supervision but also must include the culture of the workplace and the support given to employees to make safe[*] behavioral choices. Just Culture is an effective system of accountability because it says, administrators should be held to account for how effectively they are managing employee performance.

Holding administrators accountable for managing employee performance may seem like merely a redistribution of blame, *from* the employee, *to* the higher levels of the organization. The more detached management is from the field the more it may feel unfair to be held to account for a distant accident. Accountability, however, is not the goal of a Just Culture; Just Culture uses accountability as an instrument to enhance organizational resilience and reliability.

Acceptability of risk

Risk Management is the safety management program under doctrine. The practice of risk management involves identifying the various hazards associated with a task or a system; calculating or estimating severity and likelihood risks and then mitigating the risks to the level that is acceptable to the administrators. Administrators represent the levels of the organization that ethically, if not legally, are responsible for setting the limits of acceptable risk. In choosing a suppression strategy, for example, an administrator may determine s/he is only willing to accept a one out of 10 chance of structure loss. Any suppression strategy that has a less than 10% chance of structure loss is "acceptable" and therefore so are the consequences.

With respect to human safety however, we expect administrators to set extremely low levels of acceptable risk. The phrase *As Low As Reasonably Practicable* (acronym ALARP) is common in the vocabulary of risk managers[†] and is defined as the level at which any additional mitigation would be so expensive as to make the task or the objective no longer worthwhile to pursue. In concept, ALARP is the level of acceptable risk we establish for intuitively hazardous work such as wildland fireline operations. Once this is established the administrator should then make a go/no-go decision accepting the residual risks or not accepting the risks and therefore rejecting the task.

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[*] The word "safe" has many definitions but for purposes of this paper a definition from the lexicon of Risk Management is satisfactory; safe is, *the state in which the probability of harm to persons or property loss at or below, an acceptable level.*

[†] ALARP is even established within law in the United Kingdom, see: http://www.hse.gov.uk/risk/theory/alarpglance.htm

In practice, the risks faced by wildland firefighters are vague, situational and statistically unquantifiable. Even the science of fire behavior predictions is largely an art that is predicated on the art of weather forecasting. Overwhelmingly calculated probabilistic risk assessments are impossible in the wildland fire environment. Risk assessments typically are an evaluation of relative adjective ratings such as, extreme, very high, high, moderate, etcetera. Consequently, administrators redeem their responsibility to accept the residual risks (to make the "go" decision) based upon experience, peer and cultural pressures, values, assumptions, heuristics and hopefully the advice and council of experts.

Work as imagined –vs– work as done

Research in decision making in uncertain environments establishes that perceptions of risks and predictions of outcomes are overwhelmingly *intuitive.*[*] This is the "gut feeling" all firefighters recognize and many espouse as an essential decision-making skill. A firefighter's intuition arrives from numerous sources but is significantly biased by past salient experiences (e.g., *portals*[†]) and intrinsic values. The relevance of this issue is that how a firefighter perceives risk and acts upon that perception is much more influenced by his or her experiences and values rather than by rules. The more novel or unexampled the risk, particularly under time pressured situations, the greater reliance upon intuition and thus values. To a large extent the efficacy of doctrine, with respect to firefighter safety, is because it is a direct attempt influence firefighter's values by centering leadership on the core principles of sound risk management.

Nevertheless and inevitably, firefighters and fire ground commanders see and interpret risks differently than administrators. Their training and experience gives them a different view of what presents a threat and what *feels* like a safe strategy. They also feel (quite literally) the consequences of excessive caution in the form of homes (not just structures) burning, days of hard labor apparently "wasted" or small fires that became "dangerous" due to a lack of aggressiveness when aggression could have made the difference. Consciously or not, firefighters conduct their own risk assessment, setting their own ALARP, based on their experience, peer and cultural pressures, values, assumptions, heuristics etc. Inevitably therefore, there is *always* a difference, a "gap", between how firefighters make sense of risks and sort out competing goals and how the administrator's imagine firefighters should make sense of risks and competing goals.

The *gap* is at once a fascinating and frustrating phenomenon to human factors and safety professionals. In spite of all well crafted and explicitly mandatory risk mitigations, trainings, disciplinary actions, incentives and other attempts manage performance, human fallibility will lead to mistakes and human creativity will lead to innovations intended to make work *better*. The reasons why even the most conscientious and professional among us creatively depart from prescribed procedures is most aptly articulated by Nathanael & Marmaras:

> *"In a field of practice, people do not just receive the top-down prescriptions and a definite plan for action. More often than not, they treat prescriptions as a constraint and an affordance space, devising their own original understanding of what, how and why. The original understanding will be built through an interpretation of prescriptions, in a mute dialectic with their accumulated experience, motivational stance, peer accountability, but also depending on the particular circumstances, of*

[*] See *Risk Judgment Under Uncertainty: Heuristics and Biases*; Edited by Daniel Kahneman, Paul Slovic and Amos Tversky © 1982 Cambridge University Press, reprinted 2001; and in particular *Facts Versus Fears: Understanding Perceived Risk*, by Paul Slovic, Baruch Fischhoff, and Sarah Lichtenstein; p.463-489 of this text.

[†] For a brief but engaging discussion on the effects on safety from life changing experiences, see, www.wildfirelessons.net/documents/Chamberlin.pdf

the moment. (Dialectic as employed here is inspired by the Hegelian notion as a process of dialogue which proceeds through making contradictions and polarities explicit and resolving or mitigating them through synthesis.) It is ultimately this understanding that will guide their actions."[*]

The use of the term "affordance space" as used above is particularly appropriate in the discussion of firefighter values. Through the lens of an individual's values, every prescription has an individual interpretation. Values, even more so than prescriptions, determine an employees' *affordance space* for how they interpret and perceive risk and then, manage trade-offs between effectiveness, efficiency, safety and the multivariate social pressures.

A principle of Just Culture is that management accepts the responsibility to manage employee reliability. Taken to the natural conclusion, this means that management accepts the responsibility to manage employee values. This is nothing new; the essence of leadership is motivation through values. What *is* new about the Just Culture approach is that as management learns to accept the responsibility to manage employee values, it becomes accountable to this responsibility. This is the distributed *justice* of Just Culture.

In a traditional (or at least stereotypical) compliance-based culture, there are powerful incentives to obfuscate, conceal, ignore or deny that there a gap. When the gap suddenly surfaces in the wake of an accident it is invariably a surprise to administrators (and often to the firefighters). Most typically, those firefighters at the sharp end of the sword; those who's interpretation of risks and competing goals differ from the administrators (the gap creators?) are be blamed. Reviewing accident reports (e.g., Cramer, Thirtymile, Devil's Den to name just a few) it is clear the report writers themselves were somewhat dumbfounded that the firefighters could not have foreseen how their divergence from procedure (i.e., what administrators imagined they would do in that situation) was putting themselves at grave risk.

A Just Culture asks: Why we are shocked? Who should have known the gap existed before the accident? The gap didn't just happen at Cramer, Thirtymile, Devil's Den and other tragedy fires; obviously, some amount and level of gap is always present in any human endeavor. The more effectual and the more just approach in the wake of accidents is to explore or "investigate" the loss of situational awareness at the leadership level that was evidently quite blind to how work was actually getting done.

Doctrine requires administrators to expect and respect the gap. Administrators must manage knowing they can never fully understand the risks and pressures faced by firefighters – particularly in the wildly unpredictable workplace of the wildland fire environment. Management should work to understand why the gap exists and rarely develop rules and procedures to try to close the gap. Addressing the gap directly with additional prescription may very well reduce safety-critical margins of creativity and flexibility. If a gap is unacceptable to administrators it is because the values of firefighters and administrators are out of alignment and this alignment should be the focus of agencies effort. Expecting and respecting the gap – not addressing it directly – is very hard work. Again, *"Management needs to know what is actually going on - but management cannot accept everything that is going on."*

Just Culture can make this work possible. To illustrate consider the following examples:

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[*] *Work Practices and Prescriptions: A key Issue for Organizational Resilience* by, Dimitris Nathanael & Nicolas Marmaras in, *Remaining Sensitive to the Possibility of Failure; Resilience Engineering Perspectives* - vol. 1, p. 103-104 © Erik Hollnagle, Christopher P. Nemeth Sidney Dekker 2008; Ashgate Publishing Limited

The mitigation (rule): *wear a hardhat on the fireline* is almost universally adopted throughout all the layers of the fire organization. It has a very low cost to production and a reasonable return on safety. The values concerning risk tolerance between firefighters and administrators are in good alignment when it comes to wearing a hardhat.

The mitigation (rule): *wear sturdy leather gloves on the fireline* is not universally accepted. Gloves interfere somewhat with precision hand work (writing, adjusting radio knobs etc.) and at times, gloves can become very hot, sweat soaked and uncomfortable. Most importantly however, the firefighter knows s/he can put them on when needed to mitigate risks and take them off when the risk is not present. Unlike a hardhat, it is extremely unlikely a firefighter will ever be exposed to a hazard where gloves are needed but there is not enough time to put them on - providing they are available.[*] From the view of most firefighters, taking one's gloves off when they are *not needed* (subjectively interpreted) is clearly an acceptable risk. The gap between how an administrator presumes work is being done (all firefighters are wearing gloves at all times) and the reality may be very large at times. Under a Just Culture administrators and firefighters can discuss and debate about this gap and together look as the reasonableness of the hazards and the rules.[†]

The mitigation (rule): *do not talk on the radio when driving*[‡] is practically universally ignored. Many, if not the vast majority of firefighters, know that implementing this mitigation would at times be a <u>significant</u> cost to production. Many also *feel* there is little if any safety value to this rule. In some instances, compliance with this rule would actually increase risks to firefighter safety; for example, by substantially delaying the arrival of leadership to an emerging incident. From the view point of most firefighters, talking on the radio while driving is very often (and very clearly) an acceptable risk. How large is the gap (between work as imagined and work as actually done) in this instance? Almost any District Ranger, for example, will at times overhear their firefighters talking on the radio and at least sometimes know that they are also driving; so the gap, at least at the field level, is likely nonexistent on this issue.

What would happen if a firefighter driving to an emerging incident and talking to a dispatcher over the radio about critical resource availability is at fault in a vehicle accident? How blameworthy is the well intended firefighter who knowingly violated a procedural rule? Again, most administrators have a reasonable amount of field experience and so would probably not see the firefighters act of rule breaking as cause for discipline. Many would not even see it as rising to the level of at-risk behavior although the severity and consequences of the accident could have a large bearing on *retrospective risk tolerance*. What if the accident occurred when the firefighter was talking on a <u>cell phone</u> to the dispatcher? Would the administrator and the firefighter still value the tradeoffs between risks and production the same way? Continuing, what if the firefighter in route to an emerging incident was involved in an accident while on a cell phone arguing with his girlfriend? If it hasn't already, this line of questioning will eventually lead to exposing a gap; not just between work as imagined and work as done, but also a gap in <u>values</u> of the firefighter compared to the administrator with respect to the acceptability of various risks. A Just Culture provides protection to dialog so that administrators and firefighters can talk about risks and the competing goals faced by the firefighters.

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[*] There are a number of accident reports where injuries occurred to firefighters in part because they were not wearing gloves. In virtually all cases this is because the firefighters had lost or misplaced his/her gloves; not because there wasn't time to put them on had they been available.

[†] See the Chalk Fire, Accident Prevention Analysis report available at: www.wildfirelessons.net

[‡] Since many employees may not know this rule exist, the reference is provided:
Forest Service Handbook 6709.11 ch 12.34

Decriminalizing the gap

As previously mentioned, the more ambiguous the environment the more human beings tend to rely on intuition or that "gut feel" to judge the severity of a threat. Very commonly one hears even seasoned firefighters refer to how they *feel* about a choice when they are choosing based on an intuition or heuristic. For example; *"I feel this is a good location for a lookout"* or, *"I feel the escape route is inadequate"* or, *"how do you feel about that dip site?* Everyone's tolerance to risk is different to the extent that their values are different. The greatest disparity of *acceptability* in the wildland fire could be expected to be between an office-raised administrator and a highly experienced, battle-hardened firefighter. A Just Culture recognizes this is a human factor; not a criminal issue.

Decriminalizing the gap is at the heart of a Just Culture. Indeed, the essential contribution of a Just Culture to Risk Management is that it insulates the dialogue between firefighters and administrators from retributive justice. It provides a safe room for sharing the values that define the limits of acceptable risk. It is through this protected dialogue that the values of administrators and the values of employees become open for reason and analysis and alignment.

Forest Service efforts into Just Culture:

In 2004 and 2005, as the Forest Service's Fire and Aviation group was developing a strategy to usher in principle-based management (the Fire Doctrine), the chief concern was the effect doctrine would have on the safety of firefighters. Specifically, our field commanders could be faced with a level of trust, flexibility and empowerment they had not previously experienced. Transitioning from a compliance-based system to a principle-based system clearly had risks; some of which were unknown. Concurrently, the United States Office of Inspector General was pursuing manslaughter charges against two Forest Service employees. Each had served as incident commander on fires that "blew-up" and killed other Forest Service firefighters. The threat of criminal liability against a well-intended civil servant arising from actions taken in the line of duty was unprecedented and sent shockwaves throughout the Forest Service. Common blog-site advice was to "lawyer-up", if ever involved in a serious accident.

Also during these years Paul Chamberlin and Peter Tolosano worked together leading the Nuttall and I-90 Tarkio entrapments investigations. These innovative fire safety officers complied with agency accident investigation protocols but through remarkable leadership skills they shifted the focus of these investigations from *finding blame* to *finding lessons* to be learned. These reports looked like a traditional accident investigation but the non-condemnatory language used and emphasis on learning excited many as a way out of the "lawyer-up" quagmire.

Inspired by the success of the Tolosano / Chamberlin reports, the Forest Service's Fire Operations Safety Council created an entirely new investigation process (termed the *Peer Review* process) that was designed to evaluate firefighter's and fire ground commander's decisions against doctrinal principles. Blame and compliance were explicitly not the focus – instead the focus was on principles and values and gap understanding. This Peer Review process did not specify a Just Culture however it did imply a "safe room" for commanders to discuss (not testify) what they knew; how they made sense of what they knew; what they intended to happen; and why - from their perspective - things didn't happen the way they intended. The intent of this new review process was to provide a forum for firefighters to share *their personal doctrine*. The charge of the Peer Review Team was to evaluate the doctrine of the firefighter against the agencies Fire Doctrine. The expectation of the Peer Review process was that the agency would begin to learn from the gap; not discipline it away.

The first test of the Peer Review process was the Ball's Canyon Fire where an engine was ordered to disengage from an indirect fireline. It became stuck while exiting the fire and was soon to be surrounded by a crown fire. The five firefighters onboard the engine narrowly escaped injury due to remarkably heroic acts of fellow firefighters and very attentive and quick reacting helicopter pilots. The Peer Review Team promised those involved in the accident that the purpose of the review was only learning. We promised the report would be non-punitive and would not focus blame for error. The review team talked to those involved about the concept of a Just Culture and shared that this process was an attempt to bring Just Culture to accident investigations.

Many of those involved in the Ball's Canyon entrapment shared openly and some shared deeply personal stories concerning the risks they took. Many others expected reprisal for their actions and so were guarded in their comments. Others, refused to participate in the review altogether. Overall, enough of those involved in the entrapment trusted the team to write a non-punitive report and so the process was successful. Within a few months of posting the report on the Wildland Fire Lessons Learned website it became the most downloaded reported *ever* on that site up until the Little Venus Peer Review Report was posted.

In Late July of 2006 the Little Venus Fire made an eight mile run down the Greybull River canyon. Ten fire fighters survived the extreme fire event in their fire shelters and two contractors narrowly escaped by outrunning the fire on horseback. Emboldened by a vague interpretation of the recently released Fire Doctrine and the success of the Balls Canyon Peer Review, the Little Venus Peer Review Team explicitly made Just Culture the foundation of the review process. Firefighters involved were unambiguously assured that no signed statements would be taken and no punitive actions would result from their actions. Almost without exception, the review team found these firefighters relieved to be able to openly and frankly share how they made sense of situation leading up to the accident and the lessons they learned for themselves. There was a very strong agreement between the firefighters involved and the Peer Review Team that this event should be exploited for its full potential to serve as a learning tool to keep other firefighters from repeating their ordeal. Knowing their stories, from their perspectives, would be published in an accident report was cathartic. The trust that enabled them to tell their stories could only have existed under the protection of a Just Culture.

In 2007, Forest Service's Peer Review Process changed names and evolved into the Accident Prevention Analysis. This process is predicated explicitly on a Just Culture. It has now become widely accepted and formally endorsed by the Forest Service Fire Directors as a powerful approach to exploiting error for its potential to reveal systemic problems. The Accident Prevention Analysis guide is revised each year in response to our growth and enhanced understanding of doctrine, risk management and especially Just Culture.

Future Just Culture efforts within the Forest Service include:

- The Intermountain Region is committed to providing training in Just Culture for all supervisory employees;
- The Risk Management Council is designing a workshop in human factors and Just Culture for Accident Investigators (expected fall 2009 or spring 2010).

Conclusion

Just Culture is the foundation of a reporting culture and a learning culture. The more developed a Just Culture is in an organization, the better that organization can build on past events and the more resilient that organization will be in facing future risks. Inherent in a Just Culture is the appreciation that system designers must account for the human element. They must accommodate firefighter fallibility and take advantage of their potential for creativity. Just Culture recognizes there is always

a gap between work as imagined by the administrators and the system designers, and the process and procedures actually used as work is actually implemented. Under the protection of a Just Culture this gap can be exploited for its high value in refining and improving risk management.

As proposed in this paper, Just Culture can be viewed as an accountability system for principle-centered management. Principle-centered management does not seek rote compliance with procedural rules but rather risk-based, intelligent and creative application fire management principles. A Just Culture uses principle-centered management to increase system reliability in two ways. First, Just Culture provides the essential safe room for dialogue to honestly share errors, mistakes, hazards and most importantly to share individual and cultural values that guide risk management choices. Secondly, Just Culture distributes accountability as it holds that management must be able to account for how it manages workplace culture and how it manages employee reliability. These are elements under the prerogative of management and it is unjust to delegate this responsibility to the firefighter.

There is a powerful symbiosis between Doctrine and Just Culture. They each make the other more resilient and redefine the end-state:

- **<u>Doctrine</u> ~ Firefighters creatively use their training and talent to meet the outcome intended by the leader including staying within the leader's level of allowable risk.**

- **<u>Just Culture</u> ~ Administrators and firefighters work openly to align their view of acceptable risk through the sharing of their doctrine, their values, their mistakes, errors, and sensemaking.**

APPENDIX D.

VIEWING ACCIDENTS AS WARNINGS OF ORGANIZATIONAL PATHOGENS DRIFT AND DEVIANCE IN THE FOREST SERVICE

Scholars in the Sociology of Science, Technology and Risk have convincingly shown catastrophic accidents are virtually always linked directly and often directly attributable to organizational pathologies. Incident Management Teams and the Forest Service in general have been lauded as a high reliability organization[*]. While this may be true in comparison to other organizations, experts[†] have shown that all bureaucratic organizations, even those attaining High Reliability Status, have a tendency to evolve overtime to normalize deviant behaviors inducing their workers to produce high consequence errors. The inoculation to this malady is through "maintaining a state of respectful wariness" [‡] exploiting the value of accidents and near-misses as warnings of organizational pathogens.

In the Forest Service wildland fire community, we have many signals that our processes and procedures are not resilient to human error and that our safety culture is not aligned with the expressed (published or promoted) values of the agency. Every year we have hundreds of near miss events, fire entrapments, and dozens of serious injuries and sometimes fatalities. Over the past several decades however we have successfully ignored these warnings by focusing our investigations on the errors of employees. In recent accident investigations and administrative reviews we have embraced the "Politics of Blame" [§] quoting Dianne Vaughan, "*Causes must be identified, and in order to move forward, the organization must appear to have resolved the problem. The direct benefit of identifying the cause of an accident as Operator Error is that the individual operator is the target of change. The responsible party can be transferred, demoted, retrained, or fired, all of which obscure flaws in the organization that may have contributed to the mistakes made by the individual who is making judgments about risk. The dark side of this ritualistic practice is that organizational and institutional sources of risk and error are not systematically subject either to investigation or other technologies of control."*

Blaming employees for organizational accidents not only obscures the accident's root cause but also destroys a reporting culture. Progress in safety depends on management recognizing that if a predictable human behavior can lead to an accident, then there is a failure in design or the implementation of the operating system and management must bear the responsibly for these failures. The concept of a Just Culture recognizes that all employees (indeed all humans) will inevitably drift from procedural rule compliance if they perceive there is an insignificant risk associated with the task and there is compelling efficiency or social utility associated with the deviation. This drift is best described as *at-risk behavior*. It is not behavior that rises to the level of recklessness or insubordination. If at-risk behavior is normal human behavior,[**] it can be predicted, expected and

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[*] *Managing the Unexpected: Assuring High Performance in an Age of Complexity* by Karl E. Weick & Kathleen M. Sutcliffe © 2001 John Wiley & Sons Inc

[†] *The Dark Side of Organizations, Mistake, Misconduct and Disaster* by, Dianne Vaughan, Annual Review of Sociology, 25 (1999): 271-305. Dr. Vaughan makes the point that virtually all leading scholars in the Sociology of Science, Technology and Risk agree that mistakes preceding disasters are systematically produced through the social organization of work and evolving organizational deviance.

[‡] *Managing the Risks of Organizational Accidents*, by James Reason © 1997 Ashgate Publishing Limited

[§] *Organizational Encounters with Risk,* Hutter & Power, Eds. New York and Cambridge: Cambridge University Press, 2004

[**] For a very readable discussion on why unsafe behavior is normal human behavior see *Techniques of Safety Management: A Systems Approach*, by Dan Peterson, © 2003 American Society of Safety Engineers

effectively managed. In a Just Culture, Management assumes the responsibility to align employee values (in this case to properly perceive risk and mitigate accordingly) with the values of the organization and is held accountable when it does not redeem this responsibility. The shift in accountability can create a positive reinforcing feedback loop. Employees can be encouraged to openly discuss their errors and at-risk behaviors under the ethical obligation to assist management in developing a safety culture and with the trust that management will use self reporting of errors ethically.

Not only do individual employees predictably drift from safe behaviors but entire organizations do as well. Commonly, organizations involved in complex work accept "Practical Drift" – an uncoupling of practice from designed procedure to handle high-risk activities when subunits are tightly coupled[*]. To the extent the actual procedures used are not reliably safe, reflects management's lack of situational awareness. Practical Drift is not necessarily good or bad; it is a fact of organizations. An outstanding example of practical drift can be found in the Little Venus Fire Entrapment Report. The report describes that multiple layers of overhead on the incident and at the Forest casually and continuously accepted the risk of using outfitters that were unescorted and lacked basic safety equipment. After the accident virtually everyone involved in incident was shocked that they accepted these risks.

Likewise complex bureaucracies, even those adroit in managing risk and labeled *High Reliability Organizations*, over time, tend to incrementally accept greater and greater risks if there is not an empowered culture of safety attentive to indicators of aberrant risk acceptance.[†] The Little Venus Report also displays an excellent example of normalizing deviant behavior at the organizational level. From mid-June through the day of the accident, three separate incident command organizations were faced with an acutely inadequate communications infrastructure. Every attempted fix to the communication problem was frustrated by a different problem. Each of the subsequent management organizations followed the decision making pattern of the initial incident command organization. Each tried to fix the problem while accepting satellite phones as temporary safety mitigation. Over time each organization learned to accept satellite phones as a satisfactory and safe mitigation. Again, after the accident virtually everyone involved in the incident agreed the behavior did not seem risky at the time but obviously was unacceptable in hindsight.[‡]
While "acts of god" or completely unforeseeable events do result in accidents, they are virtually insignificant in the study of socially meaningful disasters. Such accidents are not only rare but the mitigations would likely be unworkable. The most efficient use of finite resources lies in learning the routes of organizationally or culturally induced errors and in engineering operational procedures that are resilient to the inevitable human error through a culture of safety.

In summary, the business of the Forest Service is complex and in many situations, very high risk. We are vulnerable to accidents and near-misses and bureaucratically *prone* to misinterpret the lessons available to us from these events. Over time complex organization such as the Forest Service will inevitably, incrementally, accept greater risks. The surest way to negate this is to be vigilantly attentive to the indications of this deviance. The most obvious indicators of organizational deviance are likely displayed in accidents and near-misses. Rather than blame employees for errors our investigation processes must focus on the cultural and systemic factors that should be addressed as failed organizational defenses and the root causes of accidents.

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[*] The concept of Practical Drift is best defined in *Friendly Fire*, by Scott Snook, © 2000 Princeton University Press.
[†] *The Challenger Launch Decision: Risky Technology, Culture and Deviance at NASA*, by Dianne Vaughan, © 1996 University of Chicago Press.
[‡] Barry Turner & Nick Pidgeon's text, *Man-Made Disasters*, © 1997, Butterworth-Heinemann. 2ed. illustrates how casually organizations involved in the management of high-risk activities *learn* to ignore abundant warnings of resident pathogens until "incubation" is complete.

APPENDIX E.

REFERENCE MATERIALS FOR ACCIDENT PREVENTION ANALYSIS TEAMS:

1. Sources of Power, by Gary Klein © 1998 Massachusetts Institute of Technology

2. Managing the Risks of Organizational Accidents, by James Reason © 1997 Ashgate Publishing Limited

3. Roadmap to a Just Culture: Enhancing the Safety Environment, by the Global Aviation Information Network, Working Group E, Flight Operations / Air Traffic Control Operations Safety Information Sharing, 2004. Available on line at: http://204.108.6.79/

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APPENDIX F.

EXAMPLE DELEGATION OF AUTHORITY

File code: 6730 Date:
Route to:

Subject: Delegation of Authority

To: (Accident Prevention Analysis Team Leader)

This memorandum formalizes your appointment as team leader of the Accident Prevention Analysis Team formed to investigate, analyze and report on the (accident name, location). As team leader, you have the full authority of my office to execute and complete a thorough Accident Prevention Analysis. To the extent reasonable, follow the procedures displayed in the Accident Prevention Analysis Guide. You are scheduled to in-brief with my staff and me on ___ (date and location) _____.

_____ will be your logistical coordinator and my liaison to you. Please contact him/her at phone number _____ to discuss your logistical support needs.

You are expected to produce the 72-hour briefing report and the final report within 45 calendar days. An extension may be granted based on valid justification.

You are also expected to contact me personally and immediately if you uncover acts you believe constitute a reckless and willful disregard for human safety or involve criminal misconduct. Upon your advice, I will initiate an administrative investigation and may terminate your investigation. I respect that the information you collected from interviews will remain confidential. I also agree that no punitive actions will be taken against any employee as a direct result of information provided to the any member of your team. I will contact you periodically for an update on your progress.

Your authority includes, but is not limited to:

- Controlling, organizing, managing, and directing the investigation.
- Controlling, and managing the confidentiality of the process.
- Protecting and managing the integrity of evidence collected.
- Authorizing and requesting additional personnel, including technical specialists, to support the APA Team, and releasing them upon completion of assigned duties.

- Authorizing and coordinating the expenditure funds.
- Coordinating all media releases about the investigation.
- Issuance of Safety Alerts, if warranted, in coordination with _____ the Regional Safety Manager, cell number: _____.

All travel; equipment and salary costs related to this investigation should be charged to ___ (job code) ___ with an override code of _____.

For additional information, please contact me at phone: _____.

/s/_____
Agency Administrator

APPENDIX G.

INVESTIGATING BURNOVERS AND SHELTER DEPLOYMENTS: ASSESSING PERSONAL PROTECTIVE EQUIPMENT REVISED - JANUARY 2008 / MTDC

Table of Contents

Investigating Burnovers and Shelter Deployments: Personal Protective Equipment Assessment

Specialists familiar with the technical aspects of personal protective equipment (PPE), especially fire shelters, should examine the PPE used during a burnover. These assessments can help investigators clarify events surrounding a burnover and can help improve equipment, procedures, and training. Missoula Technology and Development Center (MTDC) equipment specialists or individuals recommended by MTDC can:

- Interview the firefighters who were involved about the use and performance of personal protective equipment (PPE)
- Examine the entrapment area
- Analyze the fire shelters and PPE

Technical specialists must be ordered through the National Interagency Coordination Center. To prepare for the arrival of the technical specialists, see **Step 1.**

Persons who are not trained in the analysis of wildland firefighting PPE should not attempt to analyze PPE used in a burnover or entrapment. If the technical specialists from MTDC are not at the site, PPE can be sent to MTDC for evaluation. To do so, see **Step 2.** Reports based only on offsite examination of materials will be very limited in scope and detail compared to those based on onsite inspections.

The written report provided by MTDC or by an individual recommended by MTDC should become part of the investigation record.

Step 1—Before Technical Specialists Arrive

The technical specialists will want to interview those directly involved in the deployment and examine the deployment site and the PPE that was used. You can help by:

1) Protecting the site to prevent disturbance, to the extent possible. Fire shelters left onsite can be weighted with rocks or other heavy objects to keep them from blowing away.
2) Collecting affected clothing from firefighters who were involved. It is not necessary to collect clothing from coroners. Technical specialists can do this, if necessary.
3) Helping make arrangements for the technical specialists to interview firefighters directly involved in the entrapment.
    a. Arranging to make the firefighters available to talk to the technical specialists. Let firefighters know that the purpose of the interview is to learn as much as possible from the event so that equipment and training can be improved.
    b. Having union representation available if necessary.

Step 2—Precautions When Collecting Personal Protective Equipment

Consider the following precautions when collecting personal protective equipment:

1) Items may be exposed to body fluids. Anyone coming in contact with these items must follow their agency's protocols against contracting bloodborne diseases.
2) Clothing recovered from burned firefighters cannot be laundered. It should be completely air dried in sunlight before being placed in red biohazard waste bags.

3) Protective latex gloves should be worn when handling these items, even after they have dried.

Step 3—Supporting Documentation

Include the following photographs and additional information with the equipment sent to MTDC:

1) Pictures of the site. Identify where the items of PPE were located and to whom they belonged, if known.
2) Pictures of surrounding fuels.
3) Pictures of the items found underneath the fire shelter.
4) As much information as possible about the deployment. If it is possible to interview victims, try to obtain answers to the questions listed in **Step 4.** If it is not possible to interview victims, try to provide answers to as many of the interview questions as possible, based on the available evidence.

Step 4—Interview Questions

1) Firefighter Information
    a. How many fire seasons experience?
    b. Position on this fire?
    c. Were you wearing flame-resistant pants and shirt? Leather boots? Hardhat? Leather gloves? Where did you obtain these items?
    d. Height and weight?
    e. New Generation fire shelter, was it a regular- or large-size shelter?
2) Training
    a. Have you received fire shelter training?
    a. When did you receive your training?
    b. Did you view a training video?
    c. Which video did you watch?
    d. Did you practice any deployments? If so, in what conditions did you practice?
    e. Did you read the fire shelter training booklet?
    b. How did you feel your training prepared you for this deployment?
    c. Do you have any recommendations for changes in the training?
3) How did you determine that you should deploy your fire shelter?
4) Deployment sequence
    a. When did you remove your fire shelter from your pack?
    b. When did you remove your shelter from its clear plastic bag?
    c. Were there any problems with either step?
    d. What did you do with your pack once your shelter was removed?
    e. How did you deploy your fire shelter? [for instance, from a standing position or a kneeling position?]
    f. Was the fire shelter fully deployed?
    g. Where were you lying (show on map, ground, or photo)?
    h. Which way was your body positioned? [for instance, where were your feet? Were you lying face down? Were you lying on your back?]
    i. Did you have any trouble getting into the shelter? Please describe.
    j. What items did you take into the shelter with you?

k.

5) Shelter experience
    a. Please describe your experience inside the shelter.
    b. Did you feel heat inside the shelter?
    c. Was smoke inside the shelter?
    d. How long did you remain in the shelter?
    e. Did you change locations during the deployment?
    f. How did you know when to come out of the shelter?
6) Did you receive any injuries? If so what were they? When did they occur?
7) Did you notice any problems with the shelter?
8) Did you notice any problems with your PPE (pants, shirt, gloves, hard hat, etc.)?
9) What can other firefighters learn from your experience?

Step 5—Shipping Equipment to MTDC

1) Fire shelters and fire shelter bags, PPE, packs, and personal belongings can be shipped to MTDC for examination.
2) Follow the precautions listed in **Step 2.**
3) Collect and bag the fire shelters and affected clothing. Label the bags with the name of the user, if known.
4) Mark the location where the items were found on a map of the site.
5) Send as much of the supporting documentation listed in **Step 3** as possible, along with the equipment.
6) Before sending items to MTDC, contact the Center's Fire Shelter Project Leader (Tony Petrilli), Fire Program Leader (Leslie Anderson), or Center Manager (vacant as of 07/09) at:
   Missoula Technology and Development Center
   5785 Highway 10 West
   Missoula, MT 59808
   Phone number: 406-329-3900
   If no one is available at MTDC, call the Missoula Interagency Dispatch Center: 406–829–7070.

APPENDIX H.

SUMMARY OF REVISIONS:

March 4, 2008

Comprehensive revision based on user feed back on Angora and Cascade APAs. Also eliminated reference to the Serious Accident Investigation Guide.

March 8, 2008

Corrected minor typographical errors.

March 24, 2008

Updated References to Appendix F. Added Appendix H.

June 5, 2008

Changed the direction concerning the recommendations section of the APA report. In this revision, recommendations are developed by the APA team but delivered separately and confidentially to the Agency Administrator. The rational for this significant change is that while the APA team will likely have developed expert knowledge of the root causes of the accident they may be too biased by their involvement in the accident to objectively develop workable recommendations. For example, some of the recommendations developed by the Cascade APA teams were reasoned to be too broad to be implementable recommendations within a complex interagency wildland fire community. While this reasoning may or may not be correct, the mere inclusion of the recommendations in the final, published, report adds unnecessary political complexity and may impede necessary organizational changes.

July, 2009

Simplified the chart in Appendix A (Decision Aide for Agency Administrators)

Deleted the Appendix C (Reference paper titled: *Accident Prevention Analysis – Intent and Purpose*) as it was deemed redundant. Replaced old appendix C with the reference paper, *Just Culture in Safety Investigations*.

Throughout the document; enhanced emphasis on workplac*e conditions and human performance shaping factors* as opposed to *causal factors*.

Added post script to the Introduction to better define the “meaning of safety”.

Substantially revised the advice on conducting the Lessons Learned Analysis and Appendix C on Just Culture.

Exchanged the recommended interview questions with those suggested by Dr’s Klein and Dekker.

Added Appendix G; for assessing PPE used in Shelter Deployments and Burnovers.

A great nation is like a great man;
When he makes a mistake, he realizes it.
Having realized it, he admits it
Having admitted it, he corrects it.
He considers those who point out his faults as his most benevolent teachers
- Lao Tzu