

THE 2 & 7 Tool

An all-risk human factors tool to help leaders prevent near misses & tragedies

In recent years, we've placed more and more emphasis on studying line-of-duty deaths (LODDs) and near misses, whether by reading NIOSH reports, Near-Miss reports (like the one on p. 110) or perusing FirefighterCloseCalls.com. The intent is to learn from these tragedies and near-tragedies so we can avoid repeating the same mistakes in the future.

With this in mind, I'd like to share a lessons-learned tool that some in the wildland community have found useful—the 2 & 7 Tool. This tool was originally designed for wildland turnover case studies, but the principles apply to the broad range of duties in the modern, all-risk fire service.

2 & 7 BACKGROUND

We often approach our case studies with an eye on tactics and fire behavior. These are critical, but they're only part of the story. No matter how well we understand these factors, we're still left with unanswered questions: Why is this happening when many of our tragedies are preceded by early warning signs

that often seem so clear in hindsight? And why do we sometimes do things that just don't make sense? These are issues of decision making, situational awareness and the human mind.

Looking at human factors is a critical element of the case-study process: The better we understand *why* people misread a fire and *why* their tactics made sense to them at the time, the better equipped we'll be to avoid making the same mistakes. The 2 & 7 Tool is a training tool firefighters can use to develop the skills to identify and mitigate breakdowns in decision making and situational awareness. Let's now take a closer look at the tool, which is made up of two errors and seven barriers.

2 ERRORS

Firefighters get hurt in a number of ways—staying in a burning building too long, using residential tactics on a commercial building, using structure fire tactics during a wildland/urban interface fire—but many of these boil down to two fundamental errors in judgment: ▶

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The 2 & 7 Tool

1. Underestimating hazards and using inadequate safety measures (e.g., inadequate lookouts, communications, escape routes and safety zones); and
2. Failing to notice changing conditions and adjust tactics accordingly (e.g., staying in the building too long).

These errors arise from two aspects of human nature: 1) optimism—we tend to assume that things will go well and that nothing bad will happen; and 2) inertia—once we form an opinion of our situation and choose a course of action, we tend to stick with it. Optimism and inertia are usually appropriate in life, even beneficial, but they sometimes get in the way of sound decision making.



The 2 & 7 Tool Basics

2 Errors

1. Underestimating hazards and using inadequate safety measures; and
2. Failing to notice changing conditions and adjust tactics accordingly.

7 Barriers

1. Inexperience
2. Getting too comfortable
3. Distraction from primary duty
4. Priorities out of order
5. Social influences
6. Stress reaction
7. Physical impairment

So how do we make decisions? Early theories held that we weigh options, analyze relevant factors and then choose the most appropriate course of action. Gary Klein's "recognition-primed decision making" is a more current model: When we look at a situation, our mind searches for a similar situation from the past, and we react to the current situation based on our past experience. Simply put: We go through "slides" in our head, pick out the one that most closely matches current conditions and act on that.

Consequently, tragedies occur when 1) we pick the wrong slide, or 2) conditions change but our slide stays the same. But why does this happen? Human optimism and inertia don't explain it all—there must be something else getting in the way.

7 BARRIERS

There are seven kinds of "barriers" that get in the way of situational awareness and sound decision making.

1. *Inexperience:* You don't have many mental "slides" for this specific situation; you don't know what to focus on and what to filter out; or you don't recognize the severity of warning signs, likely because you haven't developed the emotional triggers (the "gut reactions") that would make them stand out.
2. *Getting too comfortable:* You get too use to things working out; you get comfortable taking undue risks because they have worked in the past; or you get so use to an activity that your brain goes on

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autopilot, and you become less attentive. Some key words and phrases that relate to this concept: false sense of security, complacency, inattention, letting your guard down and mindlessness.

3. *Distraction from primary duty:* As a rule of thumb, you can only focus fully on *one* thing at a time, and you can only juggle about *five* things in your brain at once. When you try to track too many things, awareness suffers. Distractions can be external (e.g., heavy radio traffic, panicking public) or internal (e.g., conflicts, personal concerns).
4. *Priorities out of order:* We have all kinds of priorities, desires and motivations. Safety is one of the things we care about, but other things drive us as well. Examples of other motivations: arriving on scene as fast as possible, getting the fire out as fast as possible, competition, getting along, not letting people down, getting a thrill, staying comfortable and ego. We can get into trouble when this secondary stuff gets ahead of safety and effectiveness.
5. *Social influences:* We are social creatures. What's happening with the people around us affects what's happening in our mind. We've all been swayed by peer pressure and other social influences. Researcher Irving Janis coined the term "groupthink" to describe one way that social dynamics can interfere with good decision making. In groupthink situations, the group mind

locks onto a slide, and group members stop thinking for themselves; members of the group don't question the group opinion, and they tolerate higher levels of risk. Many of these characteristics sound strikingly similar to what we find in some fatality reports. This isn't to say that all group decision making is dangerous; groupthink is just one way we can go astray.

6. *Stress reaction:* Stress triggers a fight-or-flight survival mechanism—a physical, chemical change in the body and brain. Your heart rate and breathing speed up as you get ready to respond immediately to threats and challenges. As the stress reaction builds, the rational "thinking" part of the brain shuts down, and the emotional "reacting" part takes over. And when this happens, your mind locks into a course of action and you fixate on a goal; you lock into trained behaviors; when you "lock in," you block out new information; and communication breaks down. This extreme stress reaction is powerful and beneficial if you have to react quickly and fight hard or run fast. But it's not helpful for thinking clearly or seeing the big picture, and it can cause you to do things that don't make sense. Some key phrases associated with this topic: tunnel vision, action tunneling and mission fixation.
7. *Physical impairment:* Factors like fatigue, carbon

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monoxide exposure, heat stress, alcohol or drugs interfere with your ability to perceive, think and respond.

USING THE TOOL

So how do you use the 2 & 7 Tool? Find a near miss or LODD you're familiar with. If the situation involves a decision-making error, determine which of the two errors was present. Then look for how the seven barriers may have gotten in the way.

I mentioned earlier that the 2 & 7 Tool was developed within the context of wildland burnover fatalities, but that the principles apply across a broad range of mishaps and near misses. It turns out that these same dynamics also show up in our day-to-day mistakes. By looking at examples of more common event with less severe outcomes, we have an opportunity to build our awareness of the dynamics that can make a difference in serious tragedies.

The following is an off-duty driving example: A few years ago, I wrecked my car on Interstate-80 while driving to Lake Tahoe, ▶

Questions About the 2 & 7 Tool

Would it be accurate to say that human factors are more subjective than tactics and fire behavior so there will be a lot of guessing if we try to figure out why people do what they do? We know we have to go beyond what went wrong—we have to get to *why* things went wrong. But going from *what* to *why* always involves some degree of speculation; nevertheless, it's still worthwhile to run through the process because the intent is to uncover the lessons of human factors.

Does this mean that whenever people get hurt, it's because they failed? No, many factors influence incident outcomes. The human element is one piece of the puzzle. Some risks are within the scope of our duty, and sometimes accidents just happen. But many of our tragedies are preventable, and understanding the human factors involved in these situations is the motivation behind the 2 & 7 Tool.

Is it disrespectful to second-guess fellow firefighters who were doing their best and paid the ultimate price? The errors and barriers in the 2 & 7 Tool are all human dynamics that we can relate to. It's not about playing the blame game; rather, it's about learning from the experiences of others, and we can do that in a way that is still respectful and honest.

Why don't you say anything about how to mitigate this stuff? Firefighters are professional problem solvers. When we know the problems, we find innovative ways to improve. The 2 & 7 Tool offers people a system they can use to clarify the human factors issues they're seeing and learn as much as they can from their experiences. The specific mitigations and applications will be different for different people with different personalities, experiences, organizational structures, agency traditions and local factors.

Is this another checklist? The 2 & 7 Tool isn't designed to be an operational checklist. We already have enough to think about when we're on the fireground. This is a lessons-learned tool for getting as much as we can out of our post-incident critiques and case studies.



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The 2 & 7 Tool

Calif., in a snowstorm. Before the accident, I considered spending the night in Sacramento and finishing the drive the next morning. I also considered using snow chains (even though the vehicle was 4-wheel-drive) or letting one of the passengers drive. Any of these choices probably would have turned out better. But I kept driving, hit a patch of ice, lost control of the vehicle and rolled off the highway and down the side of the mountain. No one was injured but the car was totaled. So where did I go wrong?

While I was standing in the snow after the accident, looking down at my car, I ran through the 2 & 7 Tool in my head. I realized that my mistake was Error No. 1: Underestimating the hazard and using inadequate safety measures. Specifically, I underestimated the ice and over-

estimated my ability to drive in icy conditions. I could have taken additional precautions but didn't think they were necessary.

The following barriers contributed to my misperception.

- 1: Inexperience—I hadn't driven on many icy roads.
- 2: Getting too comfortable—I had a false sense of security and didn't fully appreciate the severity of the hazard.
- 4: Priorities out of order—I wanted to get to Tahoe as soon as possible; I didn't want to spend the night somewhere else and finish the drive in the morning; and I wanted to keep my passengers happy.
- 5: Social influences—My passengers wanted to get to Tahoe that night. Also, everyone *seemed* pretty comfortable with the situation, which reinforced my misperception that I had a good plan.

7: Physical barriers—Fatigue may have played a role as the accident occurred at about 1:30 a.m.

I learned a lot from this incident—more than if I had just resolved to use chains next time. It was an opportunity to take a look at my distracting priorities, misperceptions and mishandling of social influences. Although it may not be very comfortable to take an honest look at the human factors involved in such situations, it's worth the effort.

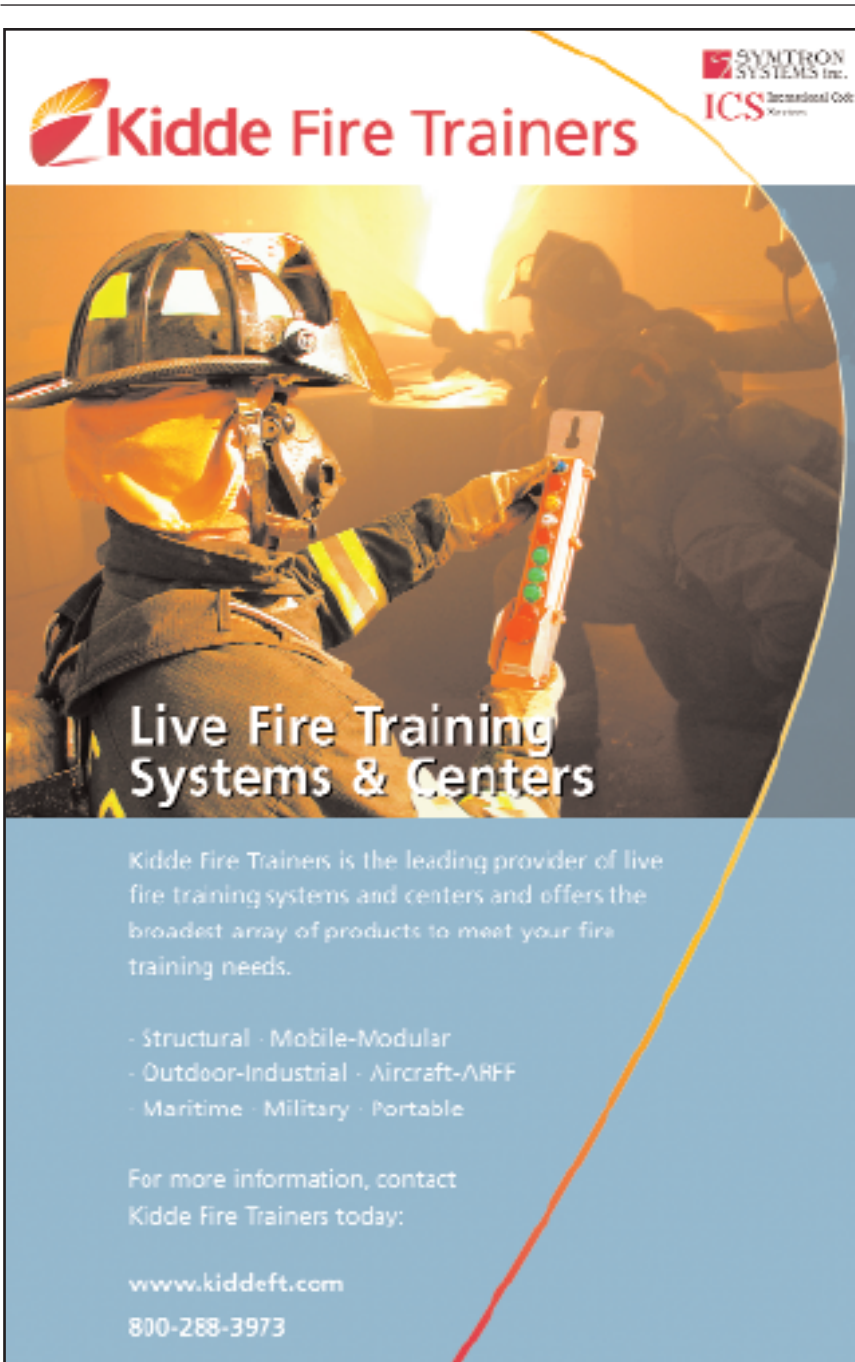
FINAL THOUGHTS

In presenting this material to departments over the past few years, I've grown convinced that the real value in the 2 & 7 Tool is not so much in the model itself, but in the exchange of ideas that it can trigger among firefighters. It provides a springboard for sharing, clarifying and developing insights and best practices, and it opens avenues for discussions among firefighters of varying experience levels. I hope the 2 & 7 Tool is useful for you and I welcome your feedback and experiences. ☺

FINAL THOUGHTS

Author's note: Many of the ideas in this article are based on interviews with California hotshot superintendents and firefighters from the Los Padres National Forest. The Wildland Fire Leadership Program has been a great resource (see www.fireleadership.gov), as have the International Association of Wildland Fire and Marty Alexander. The list of barriers was inspired by four evaluation questions in the IRPG (NWCG, 2004 ed. p. 1). Special thanks to Stan Stewart, Jim Cook and Ted Putnam for their insights.

Brad Mayhew served as a wildland firefighter with the USFS Los Padres Hotshots. He helped author the Human Factors pages for the NWCG Incident Response Pocket Guide (2006) and received the NWCG Leadership Committee's Paul Gleason Lead by Example Award for Innovation in 2007. Through Fireline Factors Consulting, he offers seminars on the 2 & 7 Tool and other human factors topics. For more information, visit www.firelinefactors.com, or contact Mayhew at 805/965-0955 or brad@firelinefactors.com.



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