



# OPERATING EXPERIENCE SUMMARY



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<b>Red</b>	Action Mode. Focused on the emergency at hand.



## Situational Awareness: Focus Can Decrease Risk and Injuries

# 1

Although the phrase “Situational Awareness” may sound highly technical, it simply means: Paying attention to what is happening around you. Workers at Department of Energy (DOE) facilities can benefit from honing their own situational awareness to reduce the likelihood of experiencing injuries on the job. Situational awareness is a skill that can prevent individuals from getting injured. This *Operating Experience Summary* focuses on the importance and benefits of situational awareness, keeping in mind that situational awareness is one piece of the large process of preventing events.

Situational awareness is the ability to scan the work environment and sense danger, challenges, and opportunities, while maintaining the ability to conduct normal activities. Failing to pay attention can be a contributing factor to injuries and accidents that range from mild sprains and strains resulting from slips, trips, and falls, to death. Often in public places, one can observe people with their heads down, looking at smartphones or reading books—some with headphones, others distracted or lost in thought. As potentially dangerous as such behavior can be, the dangers increase in the workplace, where it is essential to be alert and focused, using all senses to evaluate and appropriately respond to indications of impending danger.

### Incidents Caused by Poor Situational Awareness

The following Occurrence Reporting and Processing System (ORPS) reports have been summarized to demonstrate how situational awareness can be a part of the reason accidents and injuries occur.

- On January 23, 2015, a Pipe Fitter (PF) in the Hanford Low Activity Waste facility picked up and was carrying a 37-inch steel I-beam when he tripped over a series of four conduit stub-ups protruding approximately 17 inches from the floor. As the PF fell forward to the ground, he released the beam and attempted to brace himself. The steel beam struck him on the backside of his right hand. The PF had performed pre-install work activities in the area throughout the day and also prepared his welder, which was located adjacent to the trip hazard and identified before work began. However, when the PF lifted the piece of I-beam from the work table, he was so focused on the task of fitting the material into its final location for welding work that he forgot about the trip hazard and walked into the conduit stubs. Along with situational awareness, mitigations, and controls were noted as weaknesses in this event. (ORPS Report EM-RP--BNRP-RPPWTP-2015-0003)
- On January 29, 2015, at Argonne National Laboratory (ANL), an employee slipped and fell in a restroom when she did not notice water on the floor. In an effort to stop her fall, she grabbed for the sink counter, and jammed her right hand on it. She returned to her office and continued working for forty minutes until the increased wrist pain caused her to report the incident to her supervisor. An x-ray indicated an acute fracture to her right hand. (ORPS Report SC--ASO-ANLE-ANLE-2015-0001)
- On March 24, 2015, a Weapons Experiments, Explosives Applications and Special Projects employee at Los Alamos National Laboratory (LANL) tripped and fell over a computer box, sustaining a fractured right humerus (the long bone running from shoulder to elbow). The apparent direct cause for this event was placing a box in the walkway without



realizing the hazard it presented. The employee walked out of her workstation, carrying her lunch, when her right foot caught the corner of the computer box. There were two opportunities where situational awareness could have averted the accident: 1) Initial placement of the computer box not being recognized as a hazard, and 2) Failure to recognize there was an obstruction in the hallway while walking that path. (ORPS Report NA--LASO-LANL-FIRNGHELAB-2015-0002)

- On June 10, 2015, at Savannah River Site (SRS), an employee walking through a parking lot tripped on a yellow parking stop, fell, and suffered contusions to the right side of the body and left knee. There was a behavioral aspect to this event: the employee routinely used that path without incident, and it became an ingrained habit. That habit lessened situational awareness of potential dangers in the parking lot. (ORPS Report EM-SR--SRR-LWOGEN-2015-0003)
- On January 4, 2016, an employee tore a rotator cuff while on a step ladder. Before ascending the ladder, the employee visually inspected the step ladder and did not identify any hazards. Upon descending the ladder, the employee misjudged the distance to the ground and began to fall. His body's natural reaction of tensing up occurred and while his left hand maintained a grip on what he was working on, his left shoulder absorbed his full body weight, but he did not fall. The employee heard a pop, went home and called his supervisor. The following morning, the employee reported to Occupational Medicine and was referred off-site for evaluation where a torn rotator cuff was diagnosed. After several weeks of physical therapy and limited use, it was recommended that the employee have surgery. Corrective actions are reinforcing the need to maintain situational awareness. (ORPS Report SC--TJSO-JSA-TJNAF-2016-0002)

These ORPS reports highlight how poor situational awareness can negatively impact worker safety.

## Incidents Prevented/Reduced by Good Situational Awareness

Having good situational awareness can prevent dangerous incidents from occurring or escalating, as shown in the following example.

- On January 23, 2015, project personnel arriving for work at Crescent Junction noticed a fire burning in the left front wheel well of a General Services Administration pickup that had just traveled 35 miles from the Moab site. As the pickup was being parked, project personnel instructed the driver to quickly exit the pickup, and then they retrieved a fire extinguisher and extinguished the fire. (ORPS Report EM--GJO-RAC-CRESCNTJCT-2015-0001)

A recently published Lessons Learned article from Lawrence Livermore National Security (LLNS) illustrates how situational awareness prevented a potential electrical shock.

- On October 6, 2015, a subcontract electrician was investigating an air handler component located above ceiling tiles in a hallway. Upon accessing this workspace, he discovered four exposed electrical conductors extended out of a junction box. Their ends were in the as-cut condition and electrical tape secured them to the conduit that delivered them to the junction box. The electrician and the engineer with him stopped work immediately. The electrician replaced the ceiling tile and remained in the hallway to secure the workspace while the engineer made the appropriate notifications. The affected circuit was locked and tagged out of service. A second electrician, wearing personal protective equipment (PPE) deemed appropriate for working with this circuit when energized



(480 VAC), verified the absence of energy. The first electrician safe-ended the de-energized wires with wire nuts, secured them inside the junction box, and installed the junction box cover to create an acceptable temporary safe configuration pending removal of these conductors. Instead of focusing on just the air handler component after accessing the workspace, the electrician paused to establish his situational awareness. Upon seeing the conductors, he stopped work, informed the engineer, and both took appropriate actions. By looking beyond the immediate task in the work package and properly responding to an unexpected condition, the electrician avoided possible injuries or worse. (Lesson ID: LL-2015-LLNL-14)

This Lessons Learned contained the following Recommended Actions, which provide a good summary of how situational awareness is practiced on the job:

1. Observe the work environment, the potential hazards identified in the work package, and any other potential hazards you happen to detect.
2. Understand the multiple interfaces that will or may exist between the workers, equipment, facilities, tools, other projects/tasks in the vicinity, and environmental conditions.
3. Predict the likelihood of these interfaces producing an undesired result and the impacts of that undesired result.
4. Prevent the undesired event from happening by monitoring the interfaces in and close to your work zone. Be aware of equipment status, where you are relative to equipment (both mobile and stationary), and other work activities around you. When practical, cordon off your work zone to prevent others from entering.

5. Periodically repeat steps 1–4 as time passes or work progresses, because:
  - the completion of work can produce intended and unintended changes to the work environment that go unnoticed because we are the ones making those changes;
  - acclimation to our work environment erodes our awareness;
  - external factors can change our work environment;
  - we change as the work progresses; and
  - fatigue, frustrations, self-imposed priorities, mental distractions, and “finish-line fever” are just a few of the things that have contributed to good people getting into bad situations.

### Improving Performance

Situational awareness is a skill, and as such, can be developed over time with practice. When beginning drivers are undergoing instruction, they develop the critical skill to recognize potential hazards that they are approaching in their vehicle. For example, the new driver may be alerted to the presence of a leashed dog on the side of the road walking with its owner, and instructed to anticipate that the dog could dart into the road. Over time, with repeated actions of noticing such a hazard and anticipating its effect on the driver’s environment, a person becomes experienced and is able to notice and anticipate it with minimal mental effort. Likewise, practicing situational awareness in the daily work environment can hone hazard recognition and the ability to use it in critical or new situations. By practicing “turning on” attention again and again in a variety of situations, awareness of potential hazards or threats can become second nature.



How does one recognize hazards or threats in the first place? It is necessary to understand the concept of a “baseline,” the status of the operational environment as it exists when all systems are performing normally, including the operator. Any disruption in that baseline presents a potential hazard or threat. There could be a disruption in work process, a change in the operational environment, or a compromised operator. Being able to develop awareness is dependent upon first knowing the baseline and then recognizing any variations to that baseline.

## Obstacles to Situational Awareness

There are several obstacles to be aware of when attempting to hone situational awareness. The first obstacle is the failure to develop a keen sense of the baseline. This obstacle is the greatest hindrance in new situations, where a person is exposed to a new environment and, accordingly, a new set of potential hazards.

The second obstacle is “normalcy bias,” which is a person’s tendency is to believe that everything is okay and under control, despite the presence of discrepancies. Normalcy bias can develop when repeated disruptions of the same or similar nature occur with no adverse consequences, causing complacency. This allows the person to believe “I have encountered this before and nothing bad happened, so nothing bad will happen now.” The June 10, 2015, fall incident at SRS highlights this obstacle well: “The employee routinely utilized that path many times before without incident, and it was an ingrained habit to do so.” Normalcy bias can also occur when a planned action is set, and a person ignores or misinterprets information to allow them to continue pursuit of that action. In these ways, past experiences, or current expectations of “normalcy,” interfere with maintaining good situational awareness.

A third obstacle is defined as “focus lock.” Focus lock is an aspect of a person’s environment that is so engaging that all of a person’s attention is fixated on it, and all other environmental signals are ignored. When a person is reading and fails to notice and respond to someone calling their name, the book they are reading is the focus lock. Cell phones are an excellent (terrible!) example of focus locks because they offer many forms of distraction, including talking, texting, viewing emails, and checking social media. In the January 23, 2015, incident at Hanford, the task of carrying and installing the I-beam was the focus lock. In the March 24, 2015, incident at LANL, the mental focus on lunch preparation was the focus lock.

Finally, a person’s internal state and motivations can interfere with situational awareness. Excessive motivation or an overwhelming sense of mission importance can cause a person to filter out or ignore hazards or threats, and perform unsafe acts. Feeling overloaded or fatigued can also hinder alertness and vigilance and, therefore, negatively impact a person’s situational awareness.

## Cooper’s Color Codes

The United States military devised “Color Codes of Awareness,” which were later modified by Colonel Jeff Cooper of the U.S. Marine Corps. The codes continue to be taught to and used by military personnel, law enforcement, and civilians to this day. (Note: This should not be confused with the old color-coded Homeland Security Advisory System, which was recently replaced with the National Terrorism Advisory System.) The phrase Color Codes of Awareness refers to a person’s individual mental state and is summarized as indicated in Figure 1-1 on the following page.

<b>White</b>	Unprepared and unready to take action.
<b>Yellow</b>	Prepared, alert, and relaxed. Good situational awareness.
<b>Orange</b>	Alert to probable danger. Ready to take action.
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**Figure 1-1. Color Codes of Awareness** (Source: [http://www.campussafetymagazine.com/photos/using\\_situational\\_awareness\\_to\\_identify\\_pre\\_attack\\_indicators](http://www.campussafetymagazine.com/photos/using_situational_awareness_to_identify_pre_attack_indicators))

In condition White, people are relaxed and unaware of what is happening in their environment. They are unlikely to identify any hazards, and their safety is a matter of chance. They are unprepared to face any threats or hazards that arise.

In condition Yellow, people remain relaxed, but are aware of their surrounding environment and will notice disturbances as they occur. They will identify hazards and loosely consider “what if” contingency plans for mitigating risks that arise. It is best to operate in condition Yellow, although it may take practice for this to become the natural state.

Condition Orange is the state of recognizing specific potential risks and the formulation of a plan. As a person identifies the risk, it is natural to narrow one’s focus onto that risk alone. However, it is important to maintain awareness of all surroundings because distractions are a common cause of situational awareness loss. It is also important to recognize that a hazard’s level of visibility is not always linked with its level of danger; that is, the unseen hazard can cause more harm than the more noticeable one.

When danger is confirmed, condition Red is the mental state that prepares a person for action.

Simply becoming aware of these various mental states can dramatically increase situational awareness.

### Practice, Practice, Practice

Most people must practice situational awareness and hone the skills of being alert. Below is advice for strengthening situational awareness.

- When a person first begins honing situational awareness, it will feel awkward, as if they are paranoid, and they may find it mentally draining. The person will be moving from condition White to condition Yellow, which will make them feel like they are on “high alert.” Over time, this feeling of paranoia will fade, as condition Yellow becomes their natural state.
- While honing situational awareness, a person will have to actively fight normalcy bias as they establish the baseline in their normal operational environments. They will have to stop ignoring disturbances and assess their actual risk. Over time, this process will begin to occur subconsciously.
- It is important to fight complacency; it is the difference between condition Yellow becoming a person’s natural state and reverting into condition White.
- Before looking down, look around! If someone has to direct their attention to a specific part of the environment (e.g., the task at hand), they should first take a quick assessment of the rest of their environment before engaging their attention.
- Avoid focus locks during periods of transition and/or movement.



- Any time a disturbance is noticed and a person begins formulating a plan (entering condition Orange), they should take a minute to stop and look around to reassess the general environment and notice other disturbances they might be missing.

Developing situational awareness takes practice and determination, but it can save lives.

**KEYWORDS:** Situational awareness, focus, distractions, focus lock, Cooper's Color Codes of Awareness

**ISM CORE FUNCTIONS:** Analyze the Hazards, Develop and Implement Hazard Controls, Provide Feedback and Continuous Improvement

## References:

- United States Marine Corps (1998). *Team Coordination Training Student Guide*. Chapter 5: Situational Awareness
- Fairburn, Richard (2010). *Cooper's Colors: A simple system for situational awareness*



The Office of Environment, Health, Safety and Security (AU), Office of Analysis publishes the *Operating Experience Summary* to promote safety throughout the Department of Energy (DOE) Complex by encouraging the exchange of lessons-learned information among DOE facilities.

To issue the Summary in a timely manner, AU relies on preliminary information such as daily operations reports, notification reports, and conversations with cognizant facility or DOE field office staff. If you have additional pertinent information or identify inaccurate statements in the Summary, please bring this to the attention of Ms. Ashley Ruocco, (301) 903-7010, or e-mail address [ashley.ruocco@hq.doe.gov](mailto:ashley.ruocco@hq.doe.gov), so we may issue a correction. We would like to hear from you regarding how we can make our products better and more useful. Please forward any comments to Ms. Ruocco at the e-mail address above.