



NAVAL SAFETY COMMAND

SAFETY AWARENESS DISPATCH



SA 25-04

Latent Failures

"The root cause of a problem is never solved at the level at which it was created." - Albert Einstein

While many mishap investigations dig into the underlying influences that resulted in the mishap, others leave us guessing. They leave us wondering, "Why didn't they follow the procedure?" Or "Were they trained for that task?" *Latent failures* are those less-obvious influences that create an environment where small errors can escalate into major incidents. Latent failures can go unnoticed for weeks, months or even years before manifesting in a mishap.

Expanding on Dr. Einstein's quote — To truly fix a problem we need to investigate deeper than the surface-level where the problem appeared (e.g., *If a person falls and hits his head, the cause must be deeper than, "he fell down."* What causes (including latent factors) led to him falling?



Read and share the following lessons on how latent failures led to preventable and costly incidents that injured people and damaged equipment.

- **Attack of the Killer Tomato.** A ship with an embarked helicopter squadron scheduled a crew-served weapons shoot using a large inflatable target, commonly known as a "Killer Tomato" (see photo). With no published guidance on how to deploy the target and no leadership present, several Marines and Sailors decided to just shove it off the starboard side of the ship (*piece of cake, right?*). But a strong crosswind blew the K.T. back onto the deck after the first attempt. They renewed their efforts pushing into the wind and eventually got the target off the ship's edge, leaving only one remaining Sailor in contact with it, holding onto a rope attached to it. Shockingly (*not really*), the wind caught the Killer Tomato again and blew it back onto the flight deck. The Sailor on the rope tried to hold it back, but the rope ripped off. As the Killer Tomato flew across the ship's deck, it "attacked" (impacted) a helicopter rotor blade, rolled over the top of it, and continued off the aft edge of the flight deck into the ocean. So, it was finally in the water where they wanted it, but the Tomato's attack caused the blades on the helicopter to rotate and impact the blade of another helicopter parked next to it, rendering both blades unserviceable and downing two aircraft. — *There is no published Navy procedure for filling and launching one of these targets (the manufacturer's website has a two-page instruction guide, but it doesn't address any of the problems that happened here). With no procedure to follow and lacking leadership on deck, the Marines and Sailors tried their best, twice, with the same result. They were making risk decisions above their level. A seasoned deck supervisor would likely have recognized the futility of trying to push a giant balloon into the wind and recommended a different launch course for the target. Leaders must ensure that risk is owned at the appropriate level to avoid taking expensive equipment out of the fight.*
- **Just "Git-R-Done!"** While searching for an engine start hydraulic leak, a helicopter maintenance crew prepared to start the Auxiliary Power Plant (APP). The Auxiliary Power Plant Operator (AO) performed a preflight check and then discussed the roles, hand signals, and positions with the other two maintainers. The AO then started the APP and gave the "rotate the rotor head" signal to Maintainer 1, who relayed the signal to Maintainer 2 who was on top of the aircraft searching for the leak. Maintainer 2 tried to pass the "hold" signal back to Maintainer 1, but the rotor head was already rotating and scraped the open panel to the auxiliary power plant "doghouse." A pin protruding from the bottom of the open doghouse caused a gouge in the #3 rotor blade.

While procedural noncompliance was the primary causal factor, i.e., not closing the doghouse door, there's more to the story. The weekend crew was undermanned and undertrained. The undermanning/training resulted partly from the squadron receiving additional aircraft, resulting in a drop in the maintainer-to-aircraft ratio.

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Procedural noncompliance became the norm because the crew felt pressured to continue to perform the work despite the lack of required resources. Their “scarcity” mindset inhibited their ability to identify additional risk by not following procedures. —*Risk was passed down to the unit maintainers through personnel shortfalls with no mitigation plan. This organizational influence from manning shortfalls ultimately led to nearly \$34,000 in damage. Fortunately, no one was injured. If you leave it to your teams to ‘just figure it out,’ they will, but expect consequences in the form of damaged equipment or worse.*

- **Alone and Unafraid.** A Sailor (who was not an electrician) was conducting quarterly ventilation system maintenance, which required the unit cooler for the fan to be electrically isolated and tagged-out in accordance with the Tag-out Users Manual before performing the maintenance. The Sailor attempted to hang a tag inside a live electrical panel onto the 20 Amp, 440 Volt fuse! (*obviously not in accordance with the manual*). When he tried tying the tag to the fuse, ZAP! He felt a distinct shock and numbness on his index finger—*shocker!* (*pun intended*). The Sailor reported the instance to his supervisor, who realized that the Sailor tried to tag the fuse panel not the breaker panel per the manual. The Sailor reported to medical with a minor injury. He was a qualified damage control petty officer who met the requirements to work on the system, but he wasn’t qualified to tag it out. He also had no forceful back up or supervision when performing the tagout. If he had “completed the circuit” by touching the ship frame, those 20 Amps and 440 volts could have killed him. —*Supervisors, train your folks to the proper standard and know your team. Cross training can be a good thing, if done correctly. Don’t leave your team hanging with insufficient training or lack of supervision. Their lives depend on solid leadership.*

- **Explosives are no place to improvise.** A group of Marines received a loadout of 25 mm ammunition to link together for an upcoming range shoot. During the process, a Marine tapped the projectile end of a 25 mm round with his heel, detonating it. The shrapnel from the round traversed his left eye, fractured facial bones, and lodged in his head. Additional shrapnel wounded his right leg. The shrapnel simultaneously caused minor burns to another Marine’s face, corneal abrasions and a concussion (*BTW neither Marine was wearing the required eye protection*). Both Marines were transported to the base hospital for treatment. Complacency was listed as one of the personal-level causal factors, but several other latent factors led to the mishap. Ammunition handling procedures and training at the unit level were inadequate. While the Marines did receive instruction before the event, there was no written unit SOP on the procedure. The involved Marines also had no training in 25 mm ammunition handling. At the organizational level, the Marine Corps Reference Publication (MCRP) does not address linking, de-linking procedures or any cautionary notes for 25 mm ammunition. —*When given a task, Marines will get the job done whether there is written guidance or not. We owe it to our warriors to give them the tools, e.g., training, SOPs, doctrine, to do their jobs safely.*

Helpful Tip: The DoD Human Factors (HFACS) Analysis Classification Guide lists 37 supervisory and organizational influences that can contribute to mishaps. It’s a great reference to help identify hidden, latent factors before they appear in a mishap. The HFACS is also built into the Risk Management Information (RMI) system for reporting mishaps. See our safety awareness dispatch SA 24-05 “Why Don’t We Follow Procedures?”

Key Takeaways

Using the HFACS guide can help you learn to recognize the potential latent causes of mishaps and take action to keep your people safe and avoid breaking stuff. Here are a couple of points to consider while self-assessing your unit’s safety culture:

1. **Don’t be the one holding a secret.** If your unit doesn’t have the resources or training required to do the work, say something. We owe it to our people to set them up for success. Risk should be owned at the appropriate level in the chain of command where action can be taken to resolve the issues. Leaders, if you haven’t heard of a risk registry, check out SA-23-23 “What is a Risk Registry and Why do You Need One?”

2. **Lead.** Building on Takeaway #1, successful leaders and supervisors foster strong teamwork and communication, among other skills. While good supervisors delegate, they also know to be present when the team needs them. If your crew is inexperienced or they are performing work that carries higher than normal risk, be there!

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