



Failsafe Network, Inc.

40 Years of History

Failsafe Network was founded in 1985 by C. Robert 'Bob' Nelms. Bob was an Aerospace Engineer at McDonnell Douglas. In the mid 70's, he accepted a position with Allied Chemical in Chesterfield, Virginia. Allied was an internationally recognized leader in Manufacturing Reliability at the time. Bob became part of Allied's Corporate Reliability Center, where his attention was concentrated on Failure Analysis. These were the cutting edge days of reliability and root cause analysis. The reliability center was disbanded in 1985 and seized the opportunity to launch Failsafe Network, Inc.



The experience gained with Allied Chemical provided a solid exposure to the value of EVIDENCE. We initially focused on the physical causes of machinery failures. They were many and various. From a Nylon manufacturing plant, including mixers, extruders, and high-speed winders. To include multiple task forces to address the causes of decreased performance throughout Allied's vast manufacturing empire. Fascinating experiences with high-speed movies, infrared thermography, strain gauges, and photoelasticity. We used these and other high-tech devices to see and "feel" what the equipment and process were experiencing. We began to understand the concept of "letting the machine TALK." We continued using high-tech devices to help gather evidence while leading the investigations of several high-consequence events. The investigations that influenced us the most included:

- Catastrophic turbine-generator failure at a Soda Ash plant in Canada, where we found evidence of missing grounding brushes as well as evidence of an extremely high current flow through a critical bearing. We used special equipment and expertise to confirm the presence of extraneous magnetic currents that would have been created by this high current flow.
- Chronic boiler tube failures at a sulfuric acid plant in Delaware, where we used a NASA-developed technique to measure the size of waste acid droplets inside an actual operating burner chamber. We also removed all the used boiler tubes, laid them in a warehouse, and thoroughly documented their physical appearance. We also removed a refractory wall, brick by brick, photographing their appearance at each step. We used electron microscopy and many chemical laboratory tests to help determine the physical causes of the failures. It was during this time that we began to understand the importance of "slowing down," "rolling up your sleeves," and "letting the EVIDENCE talk



to you." It was during this time we developed a Motto for our investigations: "Whatever it takes." This motto was hung in our offices.

- Catastrophic, premature "meltdown" of a large coke oven in Michigan, where we used strain gauges to measure the deflections of structural I-beams during actual operating conditions, as well as hundreds of thermocouples imbedded within the coke oven to measure the temperatures experienced by the refractory in operation. We input the thermocouple data into a finite element model and constructed a coke oven photoelastic model to help confirm our hypotheses. This monumental investigation lasted over one year and was the most technically challenging investigation of Bob Nelms career. We learned about union/management relationships, project planning, budgeting, as well as reinforcing the "whatever it takes" mentality.



From Failsafe's inception through the early 1990's, we developed a repeatable, unique Root Cause Analysis method known as Latent Cause Analysis. After forming Failsafe, a few of the most formational investigative experiences included:

- Multiple explosions at Morton Thiokol's Solid Rocket Booster facilities near Ogden, Utah. Here, we discovered the difference between top-down approaches (Fault-Tree) and bottom-up approaches (Failure Modes and Effects Analysis) to help analyze systems for potential problems.
- Hazards Analysis of the Igniter subassembly of the Solid Rocket Booster. It was during this 6 week study that the Space Shuttle Challenger exploded. During the investigation, Bob Nelms was present at the Morton Thiokol's production facilities, and thus will forever be reflected in Failsafe's history.
- A catastrophic power failure at a large chemical plant in Tennessee. Most of the interview techniques we currently use were developed during this investigation. In addition, the concept of a Translation was also developed as a result of this incident.



Finally, the concept of Latency (as practiced by Failsafe) was born during this investigation. This investigation was one of the most influential in Failsafe's history.

- An explosion of a hydrotreater at a Canadian Oil Sands operation. Many of the stories shared during The Latent Cause Experience come from this investigation. This investigation made it crystal clear that blame is enemy number one during an investigation.
- A gas compressor failure at a Canadian Gas Plant could have had catastrophic consequences. This investigation cemented our belief that human beings cause all failure. Even more, this investigation revealed that our human tendency to try to "get away with it" is near the root of all our problems.
- Performance problems at another Canadian Gas Plant. During this investigation, we discovered that "people know everything." Although we hired many technical specialists and ran expensive lab tests, we learned nothing that the operating and maintenance people hadn't already told us. This investigation also reinforced the value of the interview techniques taught during the Latent Cause Experience.
- Investigation of reactor failures at a Mid-west refinery. The concept of a "Stakeholder Meeting" was first used here. The investigation team agreed not to share our findings ahead of time. We invited 30 people to a day-long meeting, including the new Plant Manager and his direct reports, and merely presented the evidence. After presenting the evidence, we asked them (the stakeholders), "Why do you think these reactor failures are occurring?" This changed everything, and we have learned from it and formed the basis of Failsafe's current investigative method involving stakeholders.
- A catastrophic overfill of a flare at a large gas plant. This investigation was one of our best examples of how Latent Cause Analysis can change people. Management reluctantly agreed to the accountability contract, that no retribution would result from the investigation findings as long as everyone cooperated with the process. The plant manager left the stakeholder meeting fundamentally changed, as did all the other stakeholders. He shared that he 'knowingly allowed unsafe acts for the sake of production.' Everyone sincerely sharing how they contributed to the problem changes people. Restoring honest trust in that room leaves one speechless. It is challenging to put in words.

We have learned from years of experience that only investigating big problems will ensure the continuance of big problems. We understand and share the value of using our LCA process on small events. It has become the central thrust of Failsafe's approach to learning from things that go wrong.



As Failsafe developed, the demand for field resources also increased. We became aware of the need to supply investigative resources and began licensing Failsafe Affiliates from the USA and abroad. Failsafe Affiliates are dedicated to leading investigations (by the book) using the essential elements of Latent Cause Analysis.

In summary, our methods focused on understanding the physics of our problems. Over time, however, it became apparent the need to go beyond physics. People are ultimately responsible for the things they create, whether equipment, process, or system-related. While our process continues to address the "physics" of our problems, we've gone beyond the physics and require people to see themselves as part of their problems.



We have learned that employees may face tough decisions about whether to work as intended using the existing management systems or take deviations or shortcuts due to less-than-ideal situations. This is where an organization's culture is molded. Culture reflects the way we are and the way we do things.

When addressing culture, the starting point is understanding what needs to change. Generally, most of our work culture is very good and helps us achieve our goals, but with that being said, a small part of our culture is contributing to the things going wrong within our organization. That is why an organization must have a consistent approach that effectively identifies the parts of its culture contributing to its problems. Then, we make these changes visible to those who are affected. This requires a practical approach to making them visible to the entire culture.

It is vital to give the people impacted a process that enables them to see the problems and requires them to define the plans to address them. Latent Cause Analysis does precisely that.

Failsafe has incorporated the learnings gleaned over the last 40 years from things that go wrong to develop this unique approach to helping an organization change its culture. Our process is very effective at helping individuals see and address their part. The problems affecting our culture come from each individual contributing a small part. Therefore, the solution comes by having each individual see and address their part.

