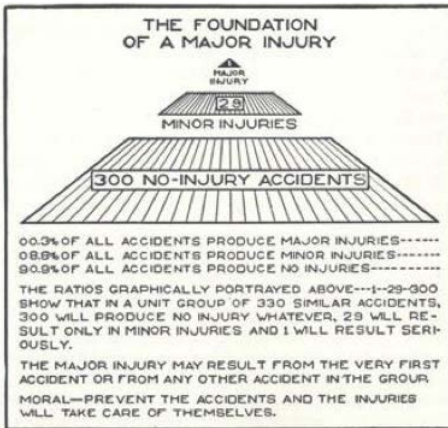


## DOES THE SAFETY PYRAMID EXIST?

BY MARK PARADIES



### CRITICS OF THE CONCEPT

Three articles in one month questioned Heinrich's safety pyramid (a basic premise of accident prevention). The first, "Reviewing Heinrich," was written by Fred Manuele and published in *Professional Safety* (October 2011). It questioned the source of the numbers in the pyramid and concluded there was no research basis for Heinrich's work.

The second, "Examining the Foundations," was written by Ashley Johnson and published in *Safety + Health* (October 2011). It discredited the concept of the accident pyramid & called for more research on the theory behind the prevention of major accidents.

The third, published in *Professional Safety*, was an announcement about a white paper from BST that highlights research that shows decreases in minor injuries do not necessarily produce decreases in serious injuries and fatalities. Tom Krause, Chair of BST and one of the originators of behavior based safety, is quoted as saying:

**"This contradicts a decades-old paradigm in the safety community which has held that declines in minor injuries produce proportional declines in serious injuries..."**

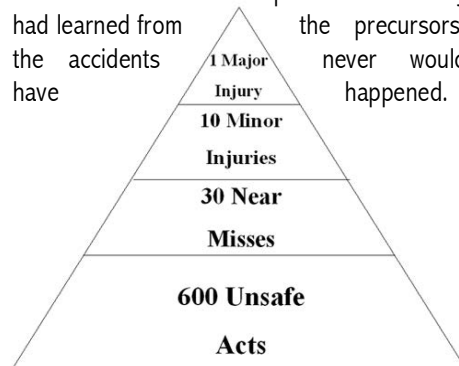
Wow! That discredits the two other pyramids (derivatives of Heinrich's work) presented on this page. Is the foundation of accident prevention crumbling?

### NOT SO FAST!

Hold on. Don't be so fast to throw out a concept that works! Your accident reduction program may not be on shaky ground IF you have been applying your resources wisely.

Just because some minor incidents are not the precursors for major accidents, doesn't mean that ALL minor incidents are not precursors for major accidents. Ask yourself this ... "Have you seen a major accident that didn't have precursors?" I haven't.

Three Mile Island, the explosion at the BP Texas City refinery, & the Deepwater Horizon accident all had precursors. If they had learned from the precursors, the accidents never would have happened.



You must focus your resources on the minor problems that could lead to major accidents and stop wasting time on "paper cuts."

### SIMPLE ACCIDENTS

But how do you understand fatalities and other major accidents? First, by understanding that there are two types of fatality accidents that you are trying to prevent. The first is simple industrial safety fatalities. These are fairly common and well understood. Samples include falling from heights, car accidents, electrocutions, being struck by moving machinery and being caught in running equipment. These are standard industrial hazards that are pretty easy to prevent if people follow fairly simple rules (safeguards). However, these accidents have few redundant safeguards – sometimes just a single human action. If these safeguards fail, then you may have a fatality (or serious injury).

For example, if a construction worker fails to wear fall protection because the job won't take long and the fall protection equipment isn't nearby, a simple misstep (slip) could cause a fatality.

To prevent these simple accidents, it is extremely important to make sure that the safeguards are available and are used.

### PROCESS SAFETY ACCIDENTS

Process safety accidents are much more complex. Process safety in complex systems comes from redundant safety features (defense in depth) that keep these more complex systems safe.

In complex processes, a single safeguard can often fail with no consequences. Why? Because there are redundant safeguards that make these processes extremely safe. This defense in depth exists because the consequences of a major accident are so severe.

However, people may start to take the safety of these systems for granted. Since a single safeguard failing does not cause a major accident, the failure of a safeguard may be tolerated. Next, the failure of several safeguards may be tolerated. Safety finally hinges upon a single safeguard. When this single safeguard fails (for example, the cement at the bottom of the well in the Deepwater Horizon accident) the seemingly impossible accident surprises everyone.



### UNDERSTANDING SIMPLE FATALITIES

There are multiple ways to understand these complex fatal accidents including tools available in the TapRooT® System. Read on and we will review several methods.

Continued on page 2

# DOES THE SAFETY PYRAMID ...

CONTINUED

## ANALYZE SIMPLE ACCIDENTS

First, if you are still having simple industrial accidents, analyze them using TapRoot®. Your SnapCharT® will give you a complete understanding of the simple chain of events. Then use Safeguards analysis to identify the Hazard (the source of the energy), the Target (usually the injured person), and the Safeguard (or Safeguards).

In simple industrial accidents, the Safeguards usually include simple human actions (watching where you walk or maintaining balance) and perhaps some simple rules (following the speed limit, staying on your side of the road, wearing fall protection, performing an adequate lock-out/tag-out).

The failure of a simple Safeguard is a Causal Factor that may be analyzed using TapRoot®'s Root Cause Tree®.

Once you understand the relationships in this simple safety system, you can develop a proactive system to audit for compliance with the simple rules and promote the rules' consistent use by applying soon-certain-positive rewards. You apply this auditing process wherever the risk of simple accidents is greatest. This is the basis of a behavior-based safety program.

However, rewards may not be enough if the task is not "human factored." That's why the Root Cause Tree® is so important when solving problems. Not only can it help solve behavioral problems, but it also helps solve human factors problems by guiding investigators to ways to improve the human factors aspects of tasks. This prevents accidents by improving human reliability.

## PREVENTING PROCESS SAFETY ACCIDENTS

Process safety accidents can also be understood by analyzing accidents. But you can't afford to wait for a major accident to learn. You must be proactive and learn before an accident happens. Once again, you can start this proactive analysis by applying Safeguards Analysis to hazardous processes.

The Hazards (sources of process energy) and the Targets are easy to identify. For complex systems, the hard part of a Safeguards Analysis is understanding the

redundant, overlapping, interrelated, and hard to test safety features (safeguards).

These safety features may:

- Have "common mode" failures
- Require human action to be successful
- Be disabled (bypassed) by human action
- Require maintenance to be reliable
- Fail in ways that aren't detectable

Ensuring the reliability of these multiple safeguards is more difficult and requires more management and engineering attention.

Learning from small failures (incidents) can help management understand how each safeguard can fail.

However, to learn, management must have a reporting system that captures the failures of individual safety features (safeguards) and management must devote resources to analyzing and fixing the root causes of these types of incidents.

## LEARN TO STOP FATALITIES

Where can you learn Safeguards Analysis and advanced root cause analysis? At the 5-Day TapRoot® Advanced Root Cause Analysis Team Leader Training. See:

[www.taproot.com/courses](http://www.taproot.com/courses)

Don't be lulled into a sense of complacency because you have reduced paper cuts and simple accidents and be surprised when neglected safety features fail causing "impossible" accidents.

## CONTINUOUS IMPROVEMENT

To become truly proactive in improving performance and avoiding process safety (and simple) accidents, you need a continuous improvement as part of operational excellence. TapRoot® Root Cause Analysis fits smoothly into a continuous improvement program.

But we want to help TapRoot® Users do even more. Therefore, every 14 months we hold a Summit to share advanced improvement technology, proven best practices, and tips to make improvement programs more effective. The next **Summit** is in **Las Vegas** on **February 29 – March 2**. See

[www.taproot.com/summit](http://www.taproot.com/summit).

Once you apply TapRoot® in a world-class improvement program, you will analyze and prevent the right incidents and this prevents fatalities. The pyramid works!

# BE CAREFUL WHAT YOU BELIEVE

Have you ever heard of the **Hawthorne Effect**? The story commonly told is that there was an industrial engineering experiment that was run at the Hawthorne plant in the 1920s. The experimenters wanted to show that increased lighting would increase productivity. So, they installed new lights and measured productivity increases. However, someone pointed out that they did not have a control group for their experiment. So, they decided to decrease lighting to show a corresponding decrease in productivity. However, when they decreased lighting, the productivity went UP again!

The "lesson learned" was that when people are watched, they will try harder and this improves productivity (at least short term).

I've heard that story (or one very similar to it) dozens of times. I've heard it so often that I came to believe that it must be a fact. However, research published in the October 2011 edition of *Human Factors* shows a completely different set of lessons learned that turn the story upside-down.

First, because the research didn't turn out as hoped, it was never officially published. Records were destroyed. Thus, people who wrote about the research (and created the story) didn't look at the original data. Instead, they looked at stories written about the research from second-hand information.

However, in the 60's a historical researcher obtained carbon copies of the original experiment data and notes from the person in charge of the research. It seems the originals had been destroyed, but the original researcher had kept copies for 40 years.

Luckily, this data was put in storage at Cornell University. Now, using modern statistical analysis and analysis of the experiment design, researchers reached new conclusions that don't support the story that had become a "fact."

To see the conclusions, including the conclusion that some lighting changes worked and others were so minor that they made no difference, read the article. But, as an investigator, take note! Second-hand stories are often inaccurate. Don't believe everything you're told. Look at the original data!



# The TAPROOT®

## Summit 2012

February 29 - March 2 • Las Vegas, Nevada



### Summit Week Schedule

Monday-Tuesday (Feb 27-28)  
Pre-Summit Courses (see list below)

Wednesday-Friday (Feb 29-Mar 2)  
5 Keynote Speakers, 40+ Breakout Sessions, Networking, Advisory Board Meeting, and Reception with Performance Improvement Exhibits

Friday PM (March 2)  
Golf Tournament & Night Out

Summit Price: \$995 USD



Astronaut Ken Mattingly



### Is the Summit for You?

*It is if you want to...*

- Take improvement to new heights.
- Solve your company's biggest problems.
- Be inspired to keep improvement going.
- Keep your knowledge state-of-the-art.
- Learn from industry leaders.
- Make valuable new contacts.
- See the latest TapRoot® improvements.
- Maintain your Certified TapRoot® Instructor status.
- Have fun meeting new people and learning best practices.

### Pre-Summit Courses

Feb 27-28 Las Vegas, NV

Mark Paradies handpicked 11 courses for the two days prior to the Summit:

- TapRoot® Analyzing and Fixing Safety Culture Issues
- Advanced TapRoot® Techniques
- Risk Analysis & Risk Management
- How to Interview & Gather Evidence
- Stopping Human Error
- Getting the Most from Your TapRoot® Software
- Fatigue Risk Management Training
- Equifactor® Equipment Troubleshooting & Root Cause Analysis (Special 2-Day)
- TapRoot® Incident Investigation & Root Cause Analysis
- TapRoot® Quality/Six Sigma/Lean Advanced Root Cause Analysis Training

Pre-Summit Course Price: \$1,095 USD. Register 3+ people at once and save \$100 each. **Save \$200 each** by registering for pre-Summit course and the Summit.

### Keynote Speakers

*Share Secrets of Success & Lessons Learned*



Gerry Migliaccio



Rene Aguilar



Christine Cashen



Beverly Chiodo

**Rene Aguilar:** Rescue of 33 Chilean Miners

**Christine Cashen:** So You Think You Have Problems?

**Beverly Chiodo:** Character-Driven Success

**Gerry Migliaccio:** What does Senior Management Want from Incident Investigation and Root Cause Analysis?

**Ken Mattingly:** Lessons Learned from Apollo 13 and Space Shuttle Operations

### Learn Best Practices

Interested in learning best practices? Check out our Summit Best Practice Breakout Tracks:

- Certified TapRoot® Instructor
- Healthcare Quality, Patient Safety, and Sentinel Events
- Human Performance and Behavior Change
- Investigation, Troubleshooting, and Root Cause Analysis
- Leading Performance Improvement
- Quality and Corrective Action Programs
- TapRoot® Software Super Users/Administrators
- Safety, Process Safety, and Risk Management
- Special Topics



Don't miss this Improvement Opportunity!

## TIME TO GET OFF THE PERFORMANCE PLATEAU?

Feel stuck? Can't seem to improve? You can't apply the same old ideas and expect continuous improvement. Don't despair. We have the answer. The Global TapRoot® Summit. That's where TapRoot® Users learn the latest performance enhancement techniques from world-class experts that are being used by industry-leading companies. Learn new ideas and best practices. Take ideas from other industries around the world and brainstorm methods for integrating them into your company. A gathering of TapRoot® Users is the best place to network and benchmark with valuable new friends. So get off the plateau! See the future from the Summit! Bring several people—an improvement team. You'll be able to cover more sessions and have allies to help you mobilize your improvement revolution back at work.

**TAPROOT® COURSES**  
**CANADA/USA/MEXICO**

Sign up 3 or more at once and SAVE \$100 per person! See the full TapRoot® Course schedule at [www.taproot.com/courses](http://www.taproot.com/courses).

**3-Day TapRoot® / Equifactor®  
Equipment Troubleshooting &  
Root Cause Analysis Course**

2.4 CEUs 4 CIH CM Points **\$1895 USD**

*Includes TapRoot® Software!*

<b>HOUSTON</b>	Jan 17-19
<b>EDMONTON</b> , AB, Canada	Jan 23-25
<b>ST JOHN'S</b> , NL, Canada	Feb 6-8
<b>CALGARY</b> , AB, Canada	Mar 7-9
<b>HOUSTON</b>	Mar 19-21

**2-Day TapRoot®  
Incident Investigation &  
Root Cause Analysis Training**

1.6 CEUs 2 CIH CM Points **\$1095 USD**

<b>ST JOHN'S</b> , NL, Canada	Feb 6-7
<b>SAN JUAN</b> , Puerto Rico (Spanish)	Feb 9-10
<b>LAKE CHARLES</b> , LA	Feb 16-17
<b>LAS VEGAS</b> , (Pre-Summit)	Feb 27-28
<b>CALGARY</b> , AB, Canada	Mar 7-8
<b>TORONTO</b> , ON, Canada	Mar 14-15
<b>HOUSTON</b>	Mar 19-20
<b>EDMONTON</b> , AB, Canada	Mar 27-28
<b>INDIANAPOLIS</b>	Apr 2-3
<b>DENVER</b> (Golden, CO)	Apr 3-4

**5-Day TapRoot®  
Advanced Root Cause Analysis  
Team Leader Training**

4 CEUs 7.5 CIH CM Points **\$2395 USD**

*Includes TapRoot® Software!*

Prior 2-Day students/licensed sites save **\$500**

<b>NEW ORLEANS</b>	Jan 23-27
<b>PHOENIX</b>	Jan 23-27
<b>OTTAWA</b> , ON, Canada	Jan 30 - Feb 3
<b>EDMONTON</b> , AB, Canada	Feb 6-10
<b>HOUSTON</b>	Feb 20-24
<b>ORLANDO</b>	Mar 5-9
<b>KNOXVILLE</b> , TN	Mar 12-16
<b>VANCOUVER</b> , BC, Canada	Mar 19-23



For TapRoot® Courses in Africa, Asia, Australia, Europe, Middle East, South America, see: [www.taproot.com/courses](http://www.taproot.com/courses)

Issue 107 - January 2012 Single Issue Price: \$14.95

**Does the Safety  
Pyramid Exist?**

(See Page 1)

**Don't Miss the  
Best Performance  
Improvement Ideas**

(See Page 3)



**ROOT CAUSE NETWORK™ NEWSLETTER**

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**Improvement Info**

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- Be Careful What You Believe** (Page 2)
- Summit Keynote Speakers** (Page 3)
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- Get Off the Performance Plateau!** (Page 3)
- Third World Safety** (Page 4Int)
- Summit Visa** (Page 4Int)

(Note: Page 4Int Only in PDF Version – e-mail: [info@taproot.com](mailto:info@taproot.com) to get yours!)

See the 2012 Public TapRoot® Training Schedule at:

[www.taproot.com/courses](http://www.taproot.com/courses)



# INTERNATIONAL ROOT CAUSE NEWS



## TAPROOT® COURSES AROUND THE WORLD

Why do industry leaders around the world use TapRoot® to find root causes? Find out at a TapRoot® Course. For a worldwide list, see: [www.taproot.com/courses](http://www.taproot.com/courses)  
Photos from recent TapRoot® Courses...



Australia



Spain



Venezuela



Norway



Philippines



India

## THIRD WORLD SAFETY?



I posted the picture above on the [Root Cause Analysis Blog](#) and asked people to do an audit of the work. I was surprised when someone said that you couldn't expect the same level of safety in the third world as in a mature industrialized nation. I hadn't considered where the shop was located. I've seen bad safety practices in many places in the US, Canada, and Europe.

Also, I've seen places in the third world with excellent safety. So, I would NOT suggest that just because a company has an operation in the third world, that safety practices have to be bad.

Someone also said that the difference was caused by regulation. I'm not sure...

What are your experiences? Have you seen good safety practices in remote locations in the third world? Is it regulation that causes safety? Or can a company have good safety practices around the world? Let us know your thoughts at the link highlighted above.

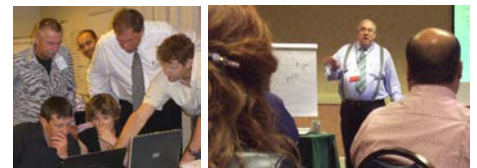
## TAPROOT® SUMMIT VISA

If you are coming from outside the USA to attend the 2012 Global TapRoot® Summit in Las Vegas on February 27 – March 2, you may need a letter of invitation to get a visa. Or you may not need a visa. See:

[www.taproot.com/wordpress/archives/24792](http://www.taproot.com/wordpress/archives/24792)

for more information on visa requirements.

If you are from a distant location, don't wait! Get the registration and visa process started now. Register on line for the Summit at [www.taproot.com/summit](http://www.taproot.com/summit).



## FACILITATION HELP

Recently we've helped facilitate incident investigations in Africa, Mexico, Canada, Pennsylvania, and Trinidad.

Does your company ever need help with a difficult investigation? Consider calling us at **001-865-539-2139** or e-mail us at [info@taproot.com](mailto:info@taproot.com). We have 40+ highly qualified TapRoot® Instructors around the world that are ready to help by facilitating your difficult investigation.

## UPCOMING TAPROOT® COURSES AROUND THE WORLD ...



See more TapRoot® Courses:  
[www.taproot.com/courses](http://www.taproot.com/courses)