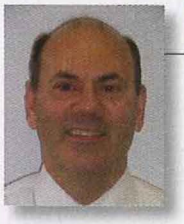

By Peter M. Curtis

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Rolling the Dice

When the human element is considered

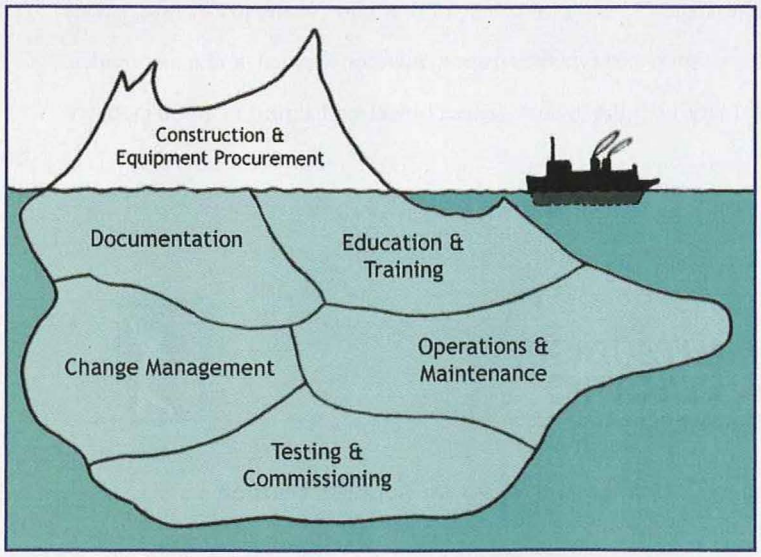
I can't say enough about human element and how it affects responsiveness and safety. January's jet landing in the Hudson River airliner and the ensuing rescue is an excellent example of how training and emergency preparedness can avoid disaster. The instinctive response and sound decisions made by Captain Sullenberger, the co-pilot, crew, city emergency staff, and New York Waterway personnel are considered best practice in my opinion, and those people should be greatly applauded. They needed to react quickly with a situational awareness so critical that seconds made a huge difference in the safety and survival of passengers and crew. A combination of emergency preparedness, situational readiness, and familiarity due to ongoing training were the major reasons why U.S. Airways Flight 1549 landed in the Hudson River between New York and New Jersey without any deaths and with few serious injuries. Flight crew training and N.Y. Waterway's quick response saved the lives of crew, passengers, and residents of New York City and New Jersey towns along the jet's flight path.

Captain Sullenberger

The largest investments are in equipment and construction—which is just the tip of the iceberg when it comes to improving reliability.

In the mission-critical industry there are times we have to spring into action promptly and do the right thing. Having the wrong personnel in the wrong place at the wrong time can lead to system failure, property damage, business interruption, and financial losses. In extreme cases such failures can compromise national security or even lead to deaths and injury. When something goes wrong, taking the proper initial response to the problem in a structured fashion is imperative and must often be carried out within seconds.

To avoid mishaps, personnel need training to take the proper action at the proper time. Software modeling for critical infrastructures is a powerful tool that simulates failures of critical equipment, allowing designers to improve system and component reliability based on different failure scenarios. Having a similar resource tool that can simulate failures, just as the airline industry has flight simulators, can serve to improve appropriate human responsiveness and help increase critical infrastructure uptime.



Human error is a major source of failure; therefore, the affect of humans on a system cannot be overlooked. Research shows that as much as 60 percent of system failures were directly or indirectly caused by human error. People react differently during normal and emergency events. A person reacts to a situation in four phases: perception, interpretation, evaluation, and action. When a problem occurs, an inexperienced or insufficiently trained operator may make mistakes in any of these phases due to increased stress. During a critical event, both errors of omission and errors of commission increase significantly as events unfold rapidly.

Omission errors include skipping entire procedures or a step in a procedure. Commission errors include selecting an incorrect control, performing a task in an incorrect order, timing errors, etc. Training should adequately pre-

pare personnel to react consistently to different situations so that when a real problem crops up, they react quickly and decisively to avoid failure.

In the mission critical industry, the largest investments are in equipment and construction—which is just the tip of the iceberg when it comes to improving reliability. Significantly less is invested in training and documentation, as well as other operational factors. A facility with insufficiently trained staff and poor documentation can be easily thrown into chaos when problems arise.

One approach to adequate training is much like the simulators used to train airline pilots, electrical system dispatchers, or nuclear plant operators to develop situational awareness and emergency response and supplement actual hands-on experience. Software modeling can replicate a facility's electrical and mechanical infrastructure and then simulate a failure at any point. This allows personnel to see what will happen when each component of the system fails and consequently teaches them exactly what they need to do to rectify the problem and keep the system on-line. Commercial software exists today that is capable of modeling entire power systems, simulating faults and creating failure mode scenarios. Users can also view the system in electrical one-line form, allowing them to see where problems will arise and how they can fix them. Experience gained through simulation can greatly reduce the potential for human error by providing personnel with understanding and awareness. Consequently, when real problems arise, personnel will be prepared for the situation, having already experienced similar circumstances, knowing the possible outcomes and how to correct the problem.

When real problems arise, personnel will be prepared for the situation, having already experienced similar circumstances, knowing the possible outcomes and how to correct the problem.

Given the positive effects of simulator training experienced by the airline and power industries, perhaps its time to employ simulator technology to benefit the many generations of operators throughout the lifecycle of mission critical infrastructure and thereby improve the odds of success. ■

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