



Treg Goss

Manager Calibration Services
Advanced Technology Services Inc.
www.advancedtech.com

QualityScan

Manufacturing's Calibration Crisis

The philosophy of calibration goes back to 1949 when the US Air Force was figuring out how many Gs a human being could handle. The experiment was known as MX981: Human Deceleration Tests. At the time, most experts believed that 18 Gs was the absolute maximum anyone could survive.

Captain John Paul Stapp, head of MX981, thought otherwise. At Muroc Army Air Field in California, test subjects (namely Stapp) were strapped to a rocket sled nicknamed "Gee Whiz," propelled them at 200 miles per hour along a half mile track, brought the subjects to a stop in less than a second and then monitored the results, which often were not good.

Captain Edward A. Murphy, Jr., an engineer on the experiment, came up with the idea of planting strain gages in the sled harness to quantify the force of gravity inflicted on Gee Whiz's riders.

After the first test run that made use of these gages, Murphy noticed that they had failed to record anything. Murphy discovered that one of his two assistants had installed them backward. According to the story, Murphy said, "If there's any way they can do it wrong, they will."

A few weeks later, when the press questioned Captain Stapp about safety concerns at MX981, he supposedly answered, "We do all of our work in consideration of Murphy's Law."

Murphy went on to design safety escape systems for the North American X-15 and the SR-71 Blackbird, and Murphy's Law continued to serve as his philosophy for safety-conscious engineering. Murphy's Law was not intended for the everyday dropped vase or spilled glass of milk. It was intended for complex systems with a slim tolerance for mistakes.

The crisis of calibration is the extent to which modern manufacturing tempts Murphy's Law.

Whereas Murphy had just four sensors to worry about, modern manufacturing operations can have as many as 25,000 gages and instruments one in plant—in other words, there are at least 25,000 things that can go wrong. At Advanced Technology Services (ATS), we've found that the average manufacturing operation has more than 9600 gages and instruments, and the majority require calibration multiple times per year.

Today, in many industries we pay people to find the answer to a problem. Murphy's Law and story suggest that we should really be rewarding

people for preventing the problem in the first place. Operating problem to problem, crisis to crisis, and failure to failure, is simply less efficient than addressing problems before they happen.

In industries like aerospace, we know that documented calibration audits are not only crucial for safety but required by law. When an aviation accident occurs, it is one of the only ways investigators can explore and hopefully rule out a manufacturing defect.

Manufacturers with less of a safety burden still stand to gain from calibration. Back in 2008, when ATS was wondering how much calibration issues can cost a company, we looked to AC Nielsen for assistance. We found that on average, poor quality calibration costs manufacturers \$1.7 million per year, while at companies with revenues over \$1 billion, calibration can take a \$4 million toll annually. Our automotive industry survey conducted back in 2006 found that stopped production costs an average of \$22,000 per minute.

The average manufacturing operation has more than 9600 gages and instruments, with varying calibration schedules.

At worst, when manufacturers fall through on calibration, they endanger the people who drive their cars, operate their machinery and rely on a myriad of mechanical and digital devices for safety. The legal costs can also be ruinous. When poor calibration leads to minor, fixable flaws, the recalls, the supply chain disruptions and public scrutiny still damage a manufacture's credibility and reputation. And when calibration mistakes are caught before goods leave the plant or warehouse, the operation has still wasted hours, days or even weeks making flawed products that can't be sold.

The story of Murphy's Law begins with four flawed gages that wasted an experiment and irritated Captain Murphy. The calibration crisis, however, happens whenever we forget to relate Murphy's insight to the tragedies and business crises that can result directly from a few flawed gages.

The lesson of knowing that things will go wrong is to do everything imaginable to prevent them from going wrong. ME