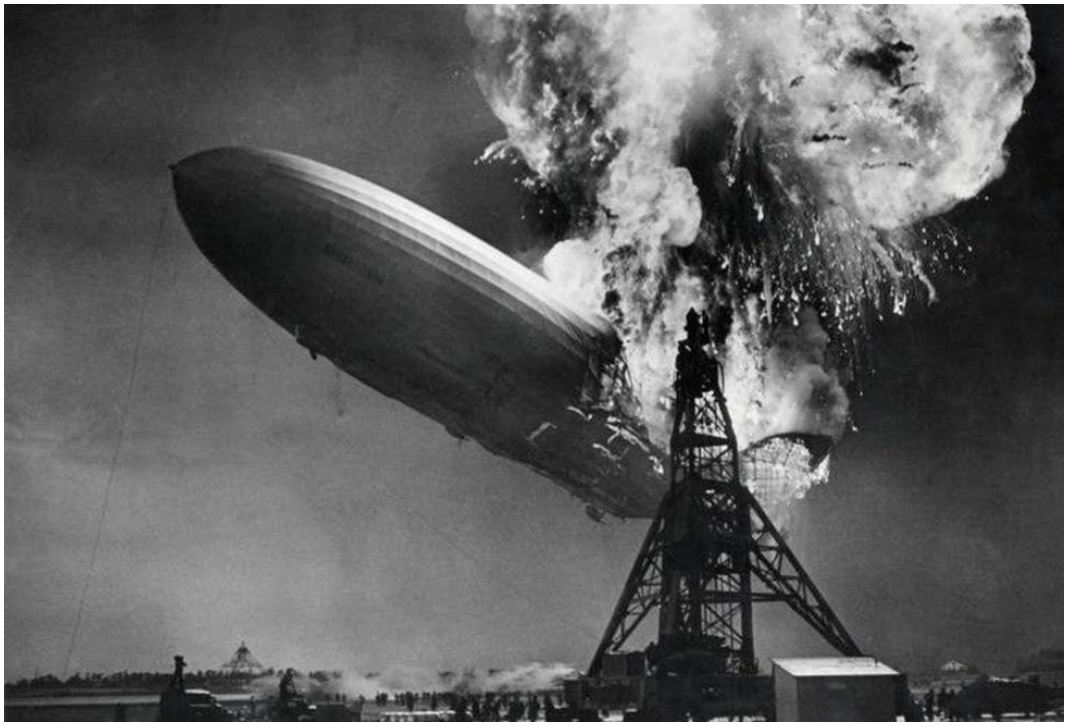
STANDARD DEVIATIONS: Calamity Control

Greetings,

Expect the unexpected. The idiom has a nice, sing-song kind of ring. Unfortunately, when the unexpected happens we get blindsided, every time; that's kind of the definition.

When we don't know what's coming, no amount of safety controls, planning, or preparedness helps. Disaster is inevitable. If we do know, then the tragedy is worse; it may have been prevented.

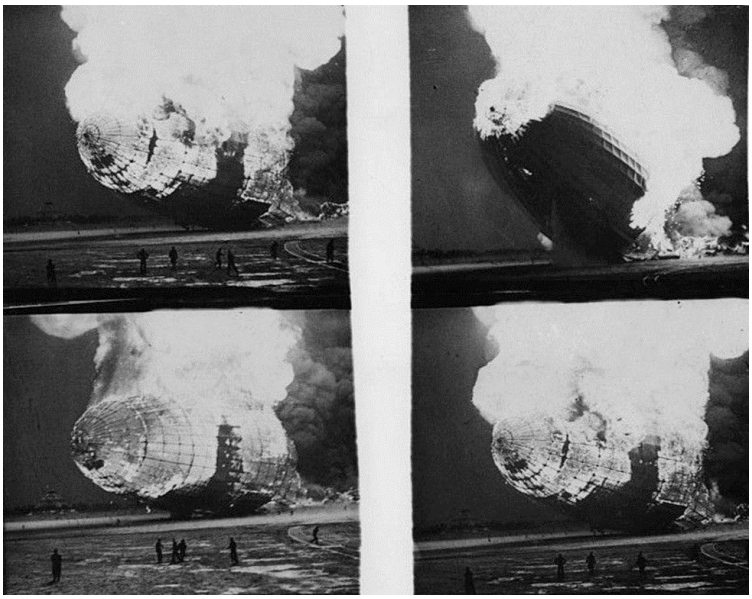
On May 6, 1937, the Zeppelin *Hindenburg* caught fire attempting to dock in Manchester Township, New Jersey. Thirty five of the 97 passengers died.



{No definitive cause has been found for the accident.}

Decades of study and speculation have tried to explain the fire that erupted; from sabotage to static electricity to hydrogen fuel leakage to incendiary paint. The fact that so many explanations even exist is worrisome in terms of the risks that weren't addressed.

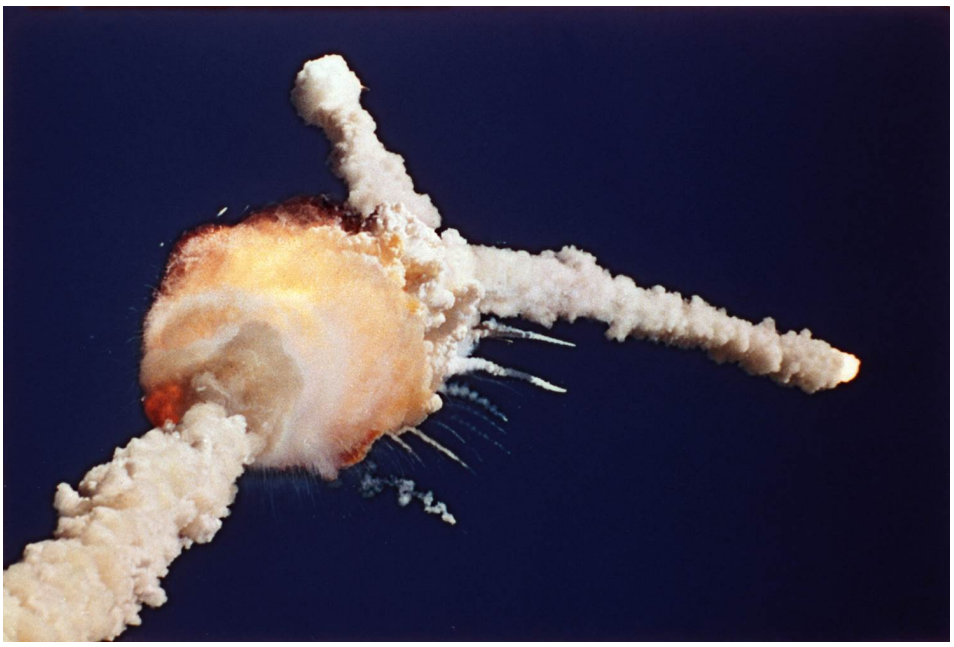
Since that event, airship technology has tried to mitigate the safety issues in dirigible flight, but they are still unstable in uncertain weather, and never became commercially viable. In 2014 only a dozen advertising airships operated, world-wide.



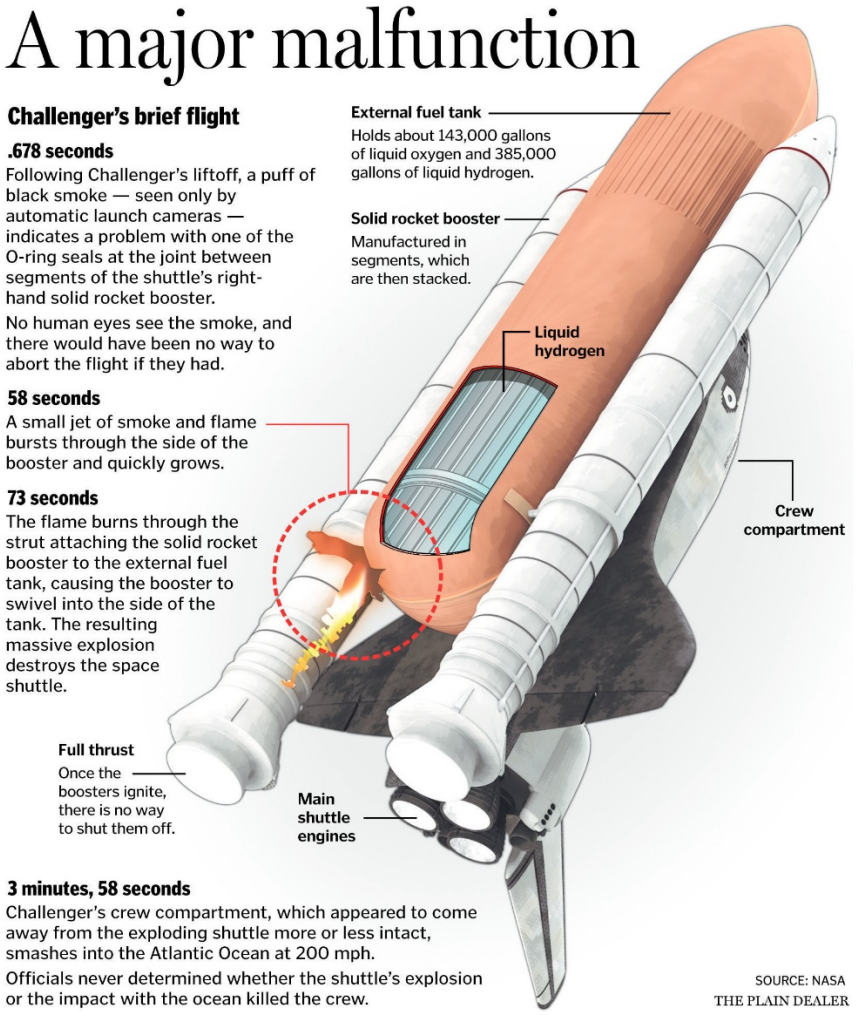
{Risk was understood but unforeseen.}

Okay. We know, with a fatal clarity, that air travel is dangerous and risk abounds. And yet ….

On January 28, 1986, the Space Shuttle *Challenger* (OV-099) broke apart 73 seconds into its flight, killing all seven crew members aboard.



The explosion was caused by O-rings in the solid fuel rocket booster. Even with engineer warnings, this failure was not anticipated and there were no controls for this kind of error. The shuttle program was delayed over 2 years in resolving the concern.



{Here's a video of that event: https://www.youtube.com/watch?v=plRkyxBL20U}

But all the attention, research, technology, repair and redesign that the Challenger explosion created did not protect or deter the disaster of the Space shuttle *Columbia*.

February 1, 2003, the Columbia disintegrated as it reentered the atmosphere, killing all seven crew members.

{Debris from Columbia as it breaks up in the atmosphere.}

The error in this disaster was found to be a piece of insulation that broke off from the external tank and struck the reinforced carbon–carbon leading edge of the orbiter's left wing.

When Columbia reentered the atmosphere of Earth, the damage allowed hot atmospheric gases to penetrate the heat shield and destroy the internal wing structure, which caused the spacecraft to become unstable and break apart.

In this case**, similar foam shedding had occurred during previous shuttle launches**, causing damage that ranged from minor to nearly catastrophic. Here is a known risk that was not properly mitigated.

{The insulation had been known to shed.}

Three disasters, all had risk. The first is still not entirely understood. The second was an unanticipated equipment failure. The third was a problem that had been known but not successfully mitigated. The difference is that the first two accidents were never anticipated, the third was.

We face similar threats on the bench. We know bad things can, and do, happen. Catastrophic failure is not the phrase that we ever want to hear at work (or anywhere). But, hey, it happens.

Natural disasters will always be out of our control. Earthquakes really happen, hurricanes and tornadoes are part of our weather, and sometimes catastrophe cannot be known until it's occurred. We can only clean up and start over.

Equipment failures are going to happen. Yes, O-rings crack and fail in labs; but so do membranes and drive motors and probes and myriad other parts and components that stop us in our tracks. These are the fails that our PM doesn't deal with. We are stuck until the problem is fixed.

And then there are the problems we know about and simply absorb some risk in order to continue running. These errors are the ones we look back at and realize that our perception put us at risk.

Little things, like a small piece of loose insulation, come back to bite us. Not taking that minute to move work to a biosafety cabinet, poor glove usage or hand hygiene, poor communication, acid/base or hot/cold handling, uncontained aerosol generating procedures, putting suspect organisms on the MALDI-TOF, etc., can all lead to preventable disaster.

We can train and drill for the unexpected events. Fire and disaster drills give us preparedness for response not prevention.

We can put redundancies and spare parts in supply to anticipate equipment failure, but, again, we can only respond to problems that have already happened.

And then there are the mistakes that we understood yet allowed to happen. These mistakes are the ones that risk analysis should identify and that we should anticipate. In these disasters, the problem is not response but our lack of preparation.

When we prepare for disaster the consequence is not quite as painful. Still painful, though. When we neglect risk the consequences can be harsh and unnecessary.

These are the disasters that should never happen. And while many errors are equipment related (glass breaks, O-rings crack, tubing comes apart, etc.), most are errors in our behavior.

We have engineering controls, and administrative controls and PPE controls to battle risk in our work. Perhaps the least-mentioned but most important safety control is our ability to understand risk and to act on that understanding before that risk becomes reality, and danger becomes disaster.

Expecting the unexpected is vital; so is preventing the preventable.

Have a great week and be safe,

Bryan