

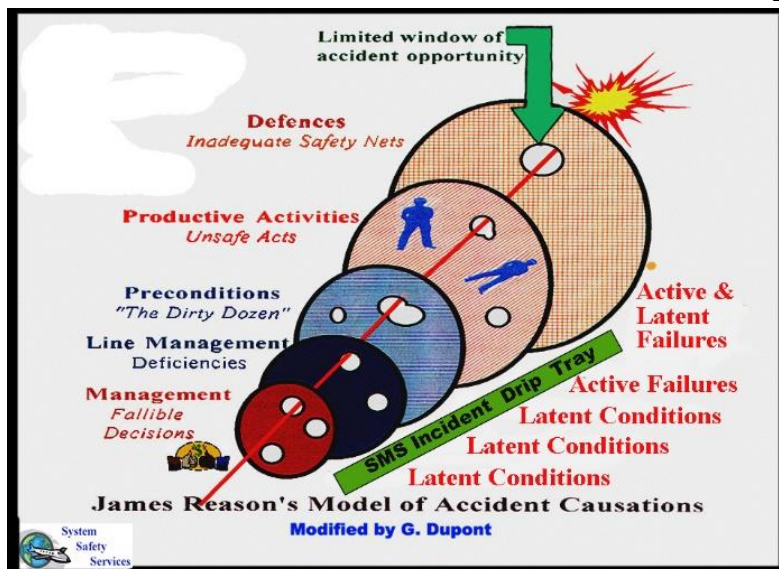
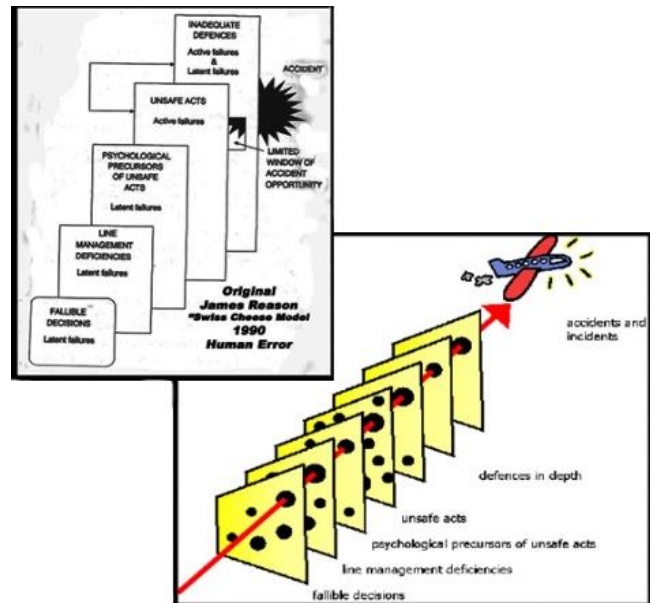


world famous in helping to illustrate the contributing factors to you making an error. See attached figures.

We are going to look at a modified model of the Swiss cheese and see how it fits into a SMS system. I introduced this model at a Human Factors in Aviation Maintenance and Inspection conference in San Francisco, sponsored by the FAA in the late 90s. Jim was in attendance and while I had conversed with him re changing his model, he saw it demonstrated there for the first time. He later commented that one should always strive to

There are many models that serve to point out that the root cause(s) of most accidents are found by looking beyond the “Guilty Party” who made the error. The root question that has to be asked is: What were the contributing factors that may have caused him/her to make the error? Once these root causes are identified, something can be done to eliminate or at least lessen them.

James Reason, who I consider the father of human error, wrote a book published in 1990 entitled simply Human Error. In this book he first introduced a model that he would later modify to resemble Swiss cheese. This model has become



improve on any work they do which he had done. He actually later did me the honour of attending one of our workshops that, when we asked the participants what they hoped to get out of this workshop, he replied that he came to steal my ideas. I replied that he couldn't do that as I would happily give them to him. I highly recommend reading his books if you are interested in human factors and human error.

Looking at the model you can see that it resembles the Swiss cheese, except that it has circular discs that can rotate. Each disc has holes in it that represent hazards. Hazards are simply anything that can cause us grief. They are not a problem until they are released. They can be around for years and some are not even recognized as a hazard until released. These hazard holes are different sizes depending on how likely they are to be released. Looking at the model one can realize that the most valuable hazards to eliminate are in the first discs, as that lessens the chances of Misfortune Murphy lining up with the later discs. I call the arrow trying to get through the hazard holes “Accident Opportunity” or “Misfortune Murphy” waiting for the opportunity to cause an accident.

Like a slot machine, the discs spin and when or where they stop no one knows, but if a set of holes line up when it stops, YOU LOSE. There will be an accident or at least an undesirable event. Before we look at each of these discs, if I was to update it I would add a small disc at the very front with holes in it and call it the Regulatory Body (FAA, TC, Etc). All too often, after an accident and looking back, one finds that: a) there was no regulation to help prevent the accident; b) there was a regulation, but it was ineffective; or c) there was a regulation but it was not being enforced. Plugging that hole (eliminating the risk or hazard) lowers the chance of an accident. For example, if you recall the Dryden accident case in the last issue, the Safety minded pilot tried to take off with snow on the super critical swept wings of his jet aircraft. Up to that time, the regulation about snow on wings said that no pilot shall take off with ice or snow on the aircraft wings unless they deem it Safe to do so. He must have deemed it Safe, as he had done it many times before on straight winged turboprops. Today, the rule says you don’t do it period and you will take deicing training every year before winter. Being a Safety-minded pilot, it is very likely he would not have tried to take off had that regulation been in place at that time.

Moving from this imaginary regulator disc we see the first red disc is named “Management” who make “Fallible Decisions”. Management’s top job is to see that the company makes a profit, but doing it with the Safety risk ALARP (As Low As Reasonably Practical). This is a balancing act which can result in decisions that lead to an accident. For example, the previous case study saw a company operating two jets with no spare parts, but utilized a system (regulatory approved) that saw them borrowing parts as needed. That could also be considered a hazard in the regulatory disc as well as they approved it. Management, also provided minimal classroom training instead of hiring a Fokker experienced AME. These holes were latent conditions that were just waiting for the holes to line up.

The next disc is “Line Management” that have “Deficiencies”. They are tasked with keeping the aircraft in the air, again with Safety ALARP. They know the regulations, but try to do what they “think” the upper management really want: profit. It is they who authorized the aircraft to fly into Dryden in iffy weather conditions, knowing that, if, with the inoperable APU, it couldn’t be deiced if it snowed. Another latent condition waiting for the holes to line up.

Next we have the “Preconditions” disc which contains the Dirty Dozen that will contribute to the next disc which is **You**. Contributing to the Dryden accident was the Lack of Knowledge hole along with the Lack of Resources, Pressure and Lack of Communication. They can be there and be latent conditions just waiting for the holes to line up.

The next disc is where the “Active Failure” occurs. Jim called it “Productive Activities” that occasionally carry out the unsafe acts. If the person fails to see or recognize the unsafe act, it may lead to an accident. For example: You are on midnight shift, get distracted and forget a tool in among a control cable pulley cluster. Fortunately you have the next very last disc of a Safety net which calls for a tool check. You notice that the 9/16<sup>th</sup> wrench is missing and retrieve it. That Safety net is a latent condition but it can become an Active Failure if you decide not to do the tool check because it is past quitting time and you’re very tired. Recall that fatigue brings on a slow insidious “don’t care” attitude. Jim called this last disc “Defences” and the holes were inadequate Safety nets.

Most of the time Misfortune Murphy fails to make it through the hazard latent conditions simply by luck. The slot machine discs failed to line up the hazards for Misfortune Murphy to go through. I added a drip tray under the discs and initially called it the “Free Lesson” drip tray. Anyone who has worked on tired radial engines knows exactly what a drip tray is for. If we will only report every time we see a near miss of Misfortune Murphy and the hazards, we get a free lesson without the accident. That is the main purpose of a functioning SMS: sweating the small stuff so you don’t sweat the big stuff. Thus, I changed the name to SMS Incident drip tray. Boeing reports that 80 to 90% of the time the corrective actions for an accident or incident are aimed at the first two discs as well as the phantom regulatory disc. If you go to our website at [www.system-safety.com](http://www.system-safety.com) and click on “Training Aids” you’ll see The Misfortune Murphy PowerPoint Presentation updated from the one I gave at the conference. Feel free to download and use as you wish. While there, check the first Safety poster of the Magnificent 7 series. There you will see Misfortune Murphy trying to throw wrenches through the holes in the discs at airplanes.

I hope that by seeing this model, you will always take the time to contribute to the SMS Incident drip tray. It will help make our industry and you Safer.