

LATENT FAILURES

What do you call a pregnant flight attendant? Pilot error. Okay, that may be a bit outdated, especially in a day and age when it's possible for a flight attendant to get a pilot pregnant. But while it's a very tongue-in-cheek use of the term "pilot error", it's still better than hearing accidents described as being due to pilot error. That's a very lazy term that does nothing to address underlying causes.

Professor James Reason at the University of Manchester coined the term "latent failure" to describe underlying causes of accidents. He studied disasters including the worst-ever air disaster (Tenerife in 1977), the worst industrial accident (Bhopal in 1984), the most famous of shipwrecks (Titanic), and the space shuttle Challenger in 1986. He concluded that while front-line operators played a part (Captain Smith on Titanic continuing at speed into an iceberg field, Captain van Zanten at Tenerife taking off without a clearance), there were contributing factors that could be traced back to people and processes well removed from the front line.

Latent (meaning hidden) failures can be management or procedural failures, poor design of equipment or systems, or poor supervision. And that's by no means a comprehensive list. Active failures are generally the ones made by the front-line operators – the pilots or ship captains or plant operators – and which have an immediate effect. Latent failures are made by people away from the front line, and may cause accidents long after the problem started. One classic example in aviation was the biggest-ever air crash involving a single aeroplane – JAL123 in 1985. It had a tailstrike in 1978 which damaged the aft pressure bulkhead. The repair was dodgy, and it was after seven years of pressurisation cycles that the bulkhead gave way and took out the aft controls. 520 dead, 4 survivors.

Systemic failures can include poor safety culture in a company, lack of training, or lack of resources. They're potentially more important than active failures because an active failure will only cause one incident or accident. A latent failure may cause many. Also, in accident investigation, identifying a latent error may prevent a number of incidents or accidents, which is why a good investigation is not satisfied with "pilot error" as an explanation.

Here are some examples of causes of latent errors or failures, which may well stimulate some discussion in that favourite aviation classroom – the bar.

Management and culture

A hypothetical example to start with: an aeroplane's brakes fail, the pilot lands long and overshoots the runway. The brakes are repaired, the aeroplane is dusted off, and it's back to normal. A good investigation would keep asking why it happened. Why did the brakes fail? Because they were low-quality material. Why were they low-quality material? Because management is telling purchasers to save money and buy the cheapest of everything. Why is management doing that? Because they value saving

money over safety. At that level of questioning, you're getting to the root cause, and addressing that underlying problem may prevent many future accidents, not just one runway excursion.

Captain Smith's decision to charge through an iceberg field at speed was an active failure. But the well-known latent failures included management pressure to go fast, and the mindset that the ship was unsinkable. In the case of Challenger, the O-ring design flaw was known, but since managers were under economic and time pressure, and since a number of missions had flown without the O-rings causing a problem, the perception that all was well was reinforced.

583 people died at Tenerife when two perfectly serviceable aeroplanes collided. Apart from the fog that prevented them from seeing each other on the runway, every other factor in the accident was human. Some of them were:

- A terrorist incident at Las Palmas Airport caused Tenerife to be overcrowded with diverted aircraft, with the taxiway blocked and aircraft backtracking on the runway.
- A management problem: KLM's strict flight duty time limitations meant that if the crew were delayed any longer, they would have to postpone the flight and find accommodation overnight for 248 people.
- A communication problem: the Spanish controller speaking to the Dutch pilots in the international language of ATC, which of course is neither Spanish nor Dutch.
- A teamwork problem: the authority gradient in the cockpit, with the cockpit crew probably reluctant to challenge the most senior check and training captain in KLM when he started taking off without a clearance. Modern CRM training includes addressing that issue.

Poor design

All aircraft designers have the good sense to make flap levers shaped like flaps and landing gear levers shaped like wheels. But their location is also important. Mr Mooney put his gear lever up at the top of the panel next to the altimeter. Not much chance of selecting wheels up when you want flaps. Mr Beech, on the other hand, built a lot of aeroplanes with gear and flap levers not only close together, but also partly hidden under yokes. Not surprisingly, Beechcraft aeroplanes figure more often than they should in gear-up landing statistics.

Poor communication

On the night of 6th July 1988, on the Piper Alpha platform in the North Sea, a work team removed a safety valve for maintenance. Due to a crane not being available, the valve was not replaced, and the job was put on hold. No one told the incoming shift that the valve was not in place. Later that evening, a pump that should not have been started without that safety valve in place, and that was not tagged or locked out, was started. That caused the initial explosion. The escalation resulted in the loss of the platform. 167 men died – the worst ever offshore oil and gas disaster. Many factors contributed, but the first one was a lack of communication. There are many lessons in the oil and gas industry that are written in the blood of the men who died that night.

Lack of training

While poor design can lead to accidents, a common cause is also lack of familiarity with an aeroplane whose controls are almost the same, but not exactly the same, as the one you last flew. If the fuel selector is on BOTH and turning it one notch to the right selects CROSSFEED, that's great. But if the same action in another aeroplane turns the fuel OFF, your type training needs to highlight that. Relying on "Well, you just need to read the checklist" is a recipe for an accident.

In 2009, Air France Flight 447 stalled and crashed into the Atlantic Ocean. The pitot tubes had frozen and malfunctioned. The accident report came to a number of conclusions, but an overriding theme was the pilots' over-reliance on automation and lack of basic flying skills. The crash prompted a renewed effort, at least by some operators, to retrain pilots to manually fly the aeroplane, no matter what the computers are telling them. Power plus attitude equals performance, whether you're in a 152 or an A380.

What were the causes?

Since the aim of good accident investigation is not to lay blame – leave that for the lawyers – but to prevent them happening again, possible latent failures should always be part of the discussion. Without trying to pre-empt the outcome, the investigation into the recent 737 MAX accidents won't come up with just "pilot error". As for the excellent example Errol wrote about in the April issue, how many contributing factors can you list?

Happy flying, and remember the navigator's prayer: Dear God, please let my errors cancel each other out.

Kevin
