Tenerife Airport Disaster, 1977

On the morning of March 27, 1977, a small bomb was detonated at the Las Palmas airport on Gran Canaria Island. A terrorist group claimed that there was a second bomb, and the airport was shut down as a precaution. All incoming air traffic was relocated 90 kilometers (55 miles) away to the smaller Los Rodeos airport in Tenerife. Thereafter, a series of truly unfortunate events led to the worst accident in aviation history. The collision of KLM flight 4805 with Pan American flight 1736 resulted in the deaths of 583 people and the beginnings of a massive overhaul in the aviation industry that continues to this day.

Los Rodeos Airport problems prior to takeoff

The necessary diversion to the Tenerife airport was difficult. The Tenerife airport was small and ill equipped to deal with a large amount of incoming air traffic. Many large planes were diverted due to the second bomb threat and were forced to double-park off of the main runway to make room for more planes. The Tenerife airport’s location was also problematic. It was situated at a high altitude and between two mountains; this meant that it was often covered in low-lying clouds that appeared as heavy, impenetrable fog. The airport was not equipped with ground radar and therefore the runway itself was often completely obscured from the view of the air traffic control tower and other pilots. In addition, Los Rodeos only had one main runway whose center guideline lights were out of order.

The diversion was particularly frustrating for the captain of KLM 4805. His flight originated in Amsterdam and he and his crew were reaching the limits of their allowable time on duty. To save time, he chose to refuel while on the ground at Tenerife, despite the fact that he had plenty of fuel to reach Las Palmas once it was open. This meant that his plane was carrying a full tank of extremely flammable jet fuel on that tragic day.

The planes begin to move and human error commences

The backup at the Tenerife airport began to lighten when the Las Palmas runway was re-opened. Pan Am 1736 was parked behind KLM 4805 and did not have room to pass despite being ready to depart before KLM 4805. The flight engineer manually measured the available runway space and determined that the Pan Am flight would have to wait until the KLM plane began moving.

Eventually KLM was cleared to taxi along the main runway. They were instructed to make a 180 degree turn at the end, where they would then have the length of the entire runway to take off. It was an unusual and difficult procedure with such a large plane, though not unheard of. The Pan Am flight was instructed to follow the same path, but they were to take the third turn-off and exit onto the main taxiway, getting them out of the way well before the KLM flight started their takeoff procedures.
Neither pilot could see past the fog. The Pan Am crew was working off a small paper map of the airport to find the right exit. They correctly identified the first two exits, but somehow missed the third and continued down the main runway. Meanwhile, the KLM pilot had begun disregarding traditional air traffic rules. The pilot had been KLM’s chief flight instructor for the last 10 years. Simulated flights often let the main pilot give their own clearance or didn’t bother with air traffic control clearance at all. However, this was not a simulated flight.

Confusion with air traffic control

The pilot reached the end of the runway and began throttling up his engines. His first officer quickly intervened, stating “wait a minute, we do not have a [air traffic control] clearance”. Impatient, the captain ordered the first officer to radio in for clearance. The first officer began his request for clearance, but the captain throttled up again in the middle of his request. Flustered, he added “we are now-eh-taking off” to the end of his request. Air traffic control assumed that they meant they were in take-off position, and radioed back “okay, stand by for takeoff. I will call you.” At that exact same moment, the Pan Am flight, alarmed by the KLM message, radioed in that they were still on the runway. Unfortunately, the two simultaneous messages generated feedback and a loud squeal drowned out most of both messages. KLM only heard “ok” from air traffic control, and it is thought that they did not receive the Pan Am message at all.

In the seconds that followed, another air traffic control message came through the system, directed to the Pan Am flight but heard in both cockpits. “Papa Alpha 1736, report runway clear.” The Pan Am flight responded “okay. We’ll report when we’re clear.” Panicked, the KLM flight engineer said “is he not clear then?...is he not clear, that Pan American?” The KLM captain snapped back “oh, yes!” Intimidated, neither the flight engineer nor the first officer, who had actually been certified for this duty by the captain, said anything else. The KLM flight raced down the runway, gaining speed for its takeoff.

The crash

Approximately 10 seconds later, the Pan Am flight became visible through the fog. The last thing heard from the KLM cockpit was the pilot’s terrified expletive as he attempted a sudden and steep ascent to get above the Pan Am flight. The Pan Am pilot executed a hard left turn to try to avoid the KLM plane. Neither maneuver was successful. The KLM flight scraped along the top of the Pan Am plane, tearing fuselage and destroying entire sections. The KLM flight crashed back to the ground a few hundred yards away. Both planes erupted into infernos, in part because of the large amount of fuel the KLM flight had taken on to save time. Neither impact was thought to be violent enough to kill all passengers immediately, but not a single person escaped the KLM inferno. A small number of people managed to escape the Pan Am flight, though some were killed on the ground by flying debris.
The official report found that there were four fundamental causes of the crash: 1) The KLM captain took off without clearance. 2) The KLM captain did not obey the “stand by for take-off” from the tower 3) The KLM captain did not interrupt take-off when Pan Am reported that they were still on the runway 4) In reply to the flight engineer’s query about whether or not the Pan Am flight had left the runway, the captain replied that they had. However, it was carefully noted that the captain did believe that he had clearance and did not deliberately cause the accident. Upon further reflection, it has been suggested that a large part of the problem was the hierarchical nature of cockpit culture. The KLM captain was experienced and respected, and the rest of the cockpit crew had been taught to not question his decisions. This, along with many other factors of aviation culture, has since changed.

Many changes were put in place following this accident. The use of colloquial phrases such as “ok” was banned, and standard phrases were put in place for use between air traffic control and pilots. The use of the phrase “take off” was restricted solely to the actual take off and banned from use at any other time during departure proceedings. Flight schools changed their programs to encourage teamwork in the cockpit. In simulations today, flight crews are often put into similar situations and then asked what they would have done differently in order to encourage team work in the cockpit. This has proven highly successful, and such teamwork managed to prevent a similar accident in Boston in 2005. Tenerife was equipped with ground radar, and recently regained its status as an international airport.

Lessons Learned

- **Standardization is key**
  One of the main contributors to the Tenerife disaster was the over-use of the words “takeoff” and “ok.” When carrying out delicate, dangerous procedures, it is important that permissions and requests be communicated as clearly as possible to avoid the type of confusion seen at Tenerife. In many cases, standardized scripts for sensitive procedures can keep communications clear and your people safe.

- **Teamwork is essential**
  The cockpit crew went against their ingrained hierarchical culture to stand up to the KLM captain twice. However, in the end, they did not do enough to stop him from making one of the biggest mistakes in
aviation history. Since none of the crew survived, it is impossible to tell why they didn’t do more, though the pilot’s long and esteemed history with the company probably had much influence over their choices. In all team work, it is vital that all members feel able to speak up, even when their opinions differ from those that are more experienced. When it comes to safety, every opinion is important and should be heard.

- Small safety measures can make a big difference
  If the Tenerife airport had been equipped with ground radar, the disaster most likely would have been averted. Though expensive at the time, the cost of such equipment was surely worth almost 600 lives. The Tenerife airport disaster is an excellent lesson in the importance of investing in all recommended safety measures so that your industry doesn’t become the next headline-grabbing tragedy.

References

Photo Credits
“Simulated crash.” http://upload.wikimedia.org/wikipedia/commons/0/0e/Tenerife747s.png