

AVIATION/COVER STORIES

'...What's he doing?

The sweet scent of flowers reaching their boats inspired ancient Romans and Greeks to call them "the Fortunate Islands." The refreshingly mild and breezy climate was praised by more modern travelers as "perpetual spring." But early natives of the Canary Islands,* 70 miles off the northwest coast of Africa, knew better. They chose the name Pico de Teide (Peak of Hell) for the 12,200-ft. volcanic mountain that looms broodingly over Tenerife, largest of the seven major islands: the natives thought the devil lurked inside it. Last week Tenerife was about as hellish as any place on earth can get.

The evidence of a single moment of holocaust lay mutely within a low-slung white hangar at Los Rodeos Airport on a 2,073-ft.-high plateau nine miles from Santa Cruz de Tenerife, the island's major city. Row after row of dark wooden coffins filled the entire floor of the 150-ft. by 150-ft. building. Inside the gleaming, metal-lined boxes lay the charred and mostly still unidentified remains of 576 victims of the worst accident in aviation history. The limbs were fixed in what pathologists term the "pugilistic position"—arms extended upward and bent inward. At Tenerife, this death posture, common in burn cases, looked like a gesture of supplication.

The inferno had occurred on Los Rodeos' single, fog-shrouded airstrip. Two 231-ft.-long Boeing 747 jumbo jets, each weighing some 700,000 lbs., had collided—incidentally—on the ground. Taking off down a runway visible for less than a sixth of its length, KLM 4805 (the *Rhine River*) smashed into Pan American 1736 (the *Clipper Victor*), taxiing toward the same takeoff point. Roaring at full power, the KLM's hot engines (2000° F.) and massive landing gear crunched through the Pan Am's fuselage with such impact and explosive fire that aluminum and steel parts of both planes were vaporized. The KLM's giant engine airlets sucked fragments of the Pan Am jet into its innards before crumpling into a molten mass 1,500 ft. past the point of impact.

All 234 passengers and the 14 crew members of the KLM plane perished. There were 67 survivors from the Pan Am plane—most of them from California, where the flight had originated. One woman died aboard the military aircraft sent

*The Romans called the islands *Insulas Canarias*, or "Islands of the Dogs," because of the many canines found there.

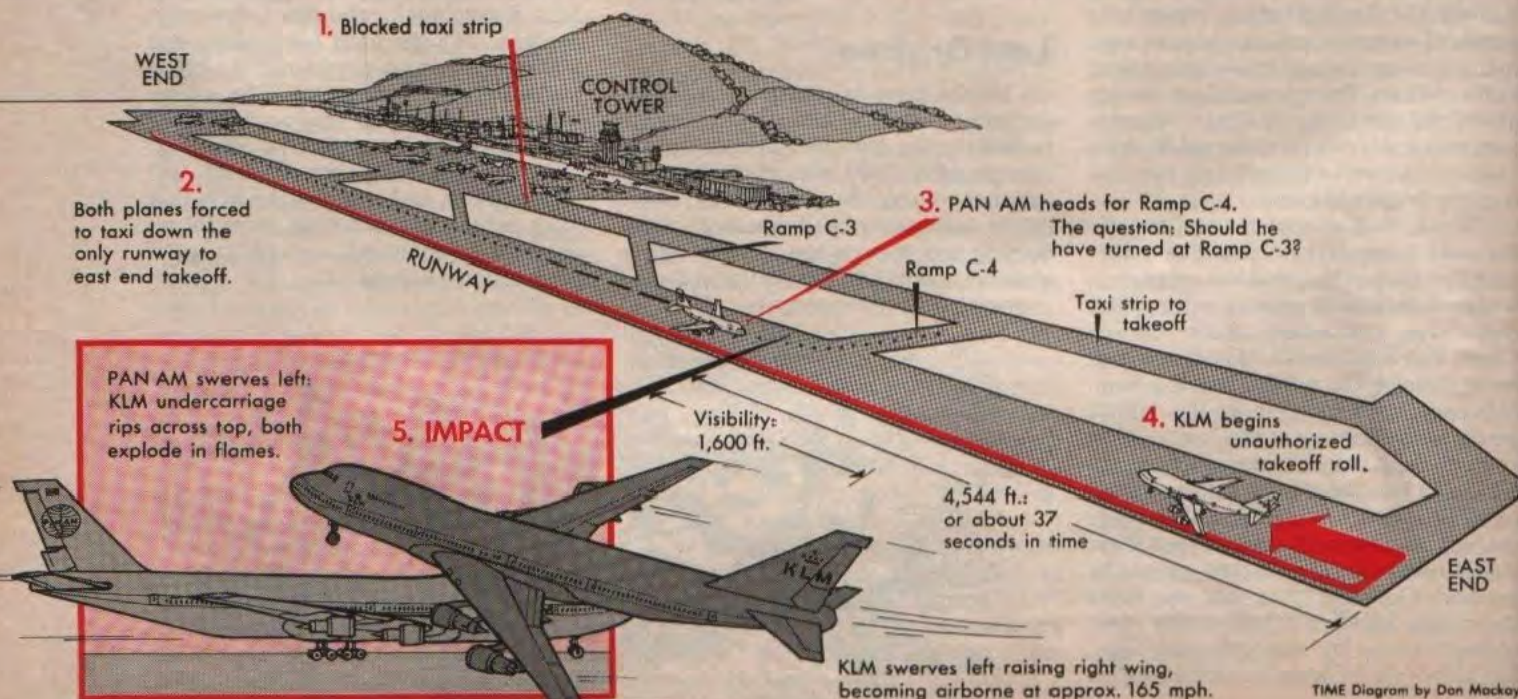
to fly the injured back to the U.S. At week's end nine remained in critical condition, suffering severe burns. The accident almost certainly will involve the highest insurance claims for any non-natural disaster. Estimates from London insurers placed the potential payout at \$240 million. Survivors in California already have filed a class action suit against KLM, Pan Am and Boeing for nearly \$2 billion.

The terrible moments at Tenerife served as a reminder that modern man, such an assumed master of technology, will never be able to control perfectly the wondrous machines he creates. Seventy investigators—representing Spain, which holds sovereignty over the Canary Islands, the U.S., The Netherlands, Pan Am and KLM—probed the disaster. Human error seemed the most probable cause. As U.S. Federal Aviation Administrator John McLucas put it: "Apparently not everybody had his head up." The only other possibility was an unlikely malfunction in radio equipment that could have prevented the KLM pilot from hearing the last vital communications from the airport tower or from the Pan Am cockpit. If both pilots and the tower controllers had fully heard—and understood—one another, the KLM pilot would never have sent his craft hurtling toward takeoff before the Pan Am plane was off the runway.

The basic causes of the disaster will probably be known when investigators finish analyzing the contents of four remarkable "black boxes" recovered from the wreckage of the two planes and sent to Washington, where there are sophisticated laboratory facilities. Actually luminous orange, the devices record all conversations in the cockpits of the two planes and critical precrash mechanical factors. Though a full report may be months in the making, the search for a cause has already narrowed to a few key mysteries:

► Why had KLM Pilot Jacob Veldhuizen Van Zanten, 51, a 25-year career flyer so experienced that he spent half his time training other KLM pilots (when a KLM official first heard of the crash he wanted to send a pilot to the investigation: Veldhuizen), rolled toward takeoff without getting tower clearance to do so? Even defensive Dutch authorities agreed that "no takeoff clearance had been given."

► Had Pan Am Pilot Victor Grubbs, 56, who had 32 years experience, actually been directed by the tower to take an



He'll kill us all !'



Shocked First Officer Robert L. Bragg of Pan Am flight; Norman Williams of Palos Verdes, Calif., in bloodstained jacket





Pan Am 747 burns while (below) Grace Ellerbrock of Laguna Hills, Calif., kneels beside husband whom she saved



DECAUX—SIPA



JULIAN WASSER



KORODY—SYGMA



Clockwise from top left: stunned passenger is moved from Tenerife hospital for flight to U.S.; others are carried off plane in San Antonio; injured girl heads for Texas hospital; survivor is rushed to hospital in Irvine, Calif.

KORODY—SYGMA



awkward, 135° backward exit onto Tenerife's ramp C-3 rather than use the more gently angled ramp C-4? Grubbs was heading toward C-4 as he moved to get in position behind the KLM plane to make his own takeoff. If he had made the earlier turn, he might have been clear of the runway before the KLM 747 reached that exit point.

► Why had the KLM pilot not heard the Pan Am *Clipper's* report that it had not yet cleared the runway and would report again when it had? Or had the KLM crew somehow mistaken the Pan Am message to mean that the *Clipper* had, rather than had not, cleared the runway? Even if there had been such a misunderstanding, of course, the KLM pilot should have awaited the tower O.K. to proceed.

The two sister aircraft that had so disastrously converged in the distant Canary Islands fell victim to split seconds of bad luck. There was every evidence that KLM Pilot Veldhuizen had heroically pulled the nose of his huge craft abruptly into the air to leapfrog over the *Clipper*. Pilot Grubbs was also violently yanking his ship to the left to get out of the way. Experts estimate that the KLM plane needed only 25 ft. of added altitude to avoid the collision, saving the Pan Am passengers. Whether Veldhuizen could have controlled his plane to avoid crashing is questionable. "He probably knew he had no chance himself," said a Pan Am investigator at Tenerife. "He tried to save us."

The fatal rendezvous had originated in two points some 6,000 air miles apart. The relatively youthful KLM passengers, including three infants and 48 children under 18 years old, had boarded the KLM flight at Amsterdam's Schiphol Airport. They were happily escaping rain, strong winds and some snow for individual vacations at resorts of their choice on Grand Canary Island, about 40 miles southeast of Tenerife. They had expected to land at Las Palmas, the Canaries' busiest city.

Their flight over Belgium, France and Spain, then southward over the Atlantic, had been smooth. Some may have been able to read KLM's in-flight magazine, featuring their skipper, Captain Veldhuizen, as a handsome example of the airline's reputation for "reliability." When word was radioed to the crew that Las Palmas Airport had been closed because terrorists had touched off a bomb in a local flower shop, injuring eight people, they landed at Tenerife instead. Veldhuizen took advantage of the delay to refuel his plane for the flight back to Holland. He took on 21,000 gallons.

By contrast, it was mostly an elderly group (70% were 55 or older) who paid up to \$2,500 each to fly the 7,100 miles from Los Angeles to Las Palmas, where they were to board the M.S. *Golden Odyssey* for a twelve-day "Mediterranean Highlights" cruise. The congenial tourists, including about 40 from the affluent retirement community of Leisure World near Laguna Hills, Calif., had some 75 unexpected extra minutes to get acquainted at Los Angeles International Airport when their charter flight was delayed. Roy L. Dorcich, 70, told Jim Naik, 37, an officer of the Royal Cruise Line, Inc., which booked the tour: "I wish I could take more of these cruises. I enjoy life so much and it is so short." He did not survive the crash.

After a stop in New York City to refuel, pick up a new flight crew and 14 more passengers, the plane flew on to the Canaries. There was no grumbling when word came that they would land temporarily at Tenerife, but the early-afternoon weather there was disappointing—cool, windy and foggy. The *Clipper* pulled into a holding area off one end of the runway. Some passengers stood at an open door to take photos of KLM 4805 as it refueled just ahead of them.

When word came that the Las Palmas Airport had been reopened, the KLM craft was still refueling, blocking the *Clipper's* way. Pan Am First Officer Robert Bragg radioed to KLM, asking how much longer the refueling would take. "About 35 minutes," came the crisp reply. Bragg and Grubbs measured the clearance around the KLM plane, found it inadequate to taxi past. KLM would have to take off first.

Visibility was later officially described as "500 meters [about a quarter-mile] and changing" when Captain Grubbs finally told the passengers: "We are taking off now." This meant that most of the 11,155-ft. runway (nearly two miles) was invisible to a pilot at one end of it. It also was hidden from the view of the

tower controllers, who as at many similar airports, had no ground radar to help them track surface traffic. For unexplained reasons, the white center-line lights embedded in the runway—a further aid to pilots when visibility is poor—were not operating. Inside the *Clipper*, Edward Hess, 39, a food broker from Phoenix, thought, "I don't know much about this, but this is below minimum." In fact, the degree of visibility remained an important point for investigators.

Though key questions remain, investigators have little doubt about the general sequence of events that followed. The tower ordered KLM to taxi the full length of the runway, make a 180° turn and hold. It ordered Pan Am to follow about three minutes behind and turn off at the "third intersection." There were four such turns (see diagram) providing runway access from the terminal apron and taxi strip. Ten planes congesting the apron blocked the jumbos from using the full taxiway to reach their takeoff point. KLM confirmed its orders and proceeded. Pan Am followed at about 6 m.p.h. In good weather, 20 m.p.h. would be normal. As the two planes moved up the runway, KLM asked the tower to confirm that Pan Am would move off at the third exit ramp. The tower reply: "Affirmative. One, two, three. The third one, sir."

The KLM crew asked for air-control clearance—meaning its flight path, not approval to take off. The tower provided the instructions. As required, KLM repeated the directions to confirm it had heard correctly.

"We are now on [or at] takeoff," said KLM.

"Stand by for takeoff clearance. I will call you back," replied the tower.

Since both pilots and the tower were tuned to the same radio frequency, the Pan Am crew heard this exchange. "He's not cleared for takeoff," someone in the Pan Am cockpit concluded reassuringly.

"*Clipper* 1736, report clear of runway," said the tower.

"We'll report when clear of runway," Pan Am replied.

"Roger, thank you," said the tower.

At this point the *Clipper* was approaching ramp C-4. It angled at about 45° to the left to join the taxiway in a short loop leading to the head of the runway. The *Clipper* had passed C-3, which headed back toward the terminal in a difficult turn for a big plane. Another sharp turn onto the taxiway would be required. Pan Am officials were later to explain that the crew considered C-1 inactive because it was blocked by aircraft and assumed that the final turn was the "third intersection" the tower meant the plane to take. Pan Am was only about 475 ft. away

UNDERTAKERS WORKING IN TENERIFE'S MAKESHIFT HANGAR MORGUE



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from its safe exit when all hell broke loose. Captain Grubbs and First Officer Bragg saw lights blurred by fog on the runway ahead of them. They thought the lights were stationary. But the glows loomed larger. They were moving.

"We are still on the runway," Grubbs shouted into his radio mike. "What's he doing? He'll kill us all!"*

"Get off! Get off!" yelled Bragg as Grubbs gunned his engines in a frantic effort to veer onto the grass and out of the path of the onrushing KLM. As the crew stared in horror, the nose of the KLM lifted sharply—but not high enough.

Bragg felt his craft shudder and heard a sound that one survivor described as being like "someone ripping a large piece of tape off the ceiling." From just two feet back of the cockpit to the tail, the entire top of the fuselage was gone. Both wings collapsed on the tarmac, engines still running. Bragg reached for the fire handles above his head. He grabbed only open sky. As the cockpit floor gave way, Captain Grubbs fell into the first-class compartment below, then somehow stumbled onto a wing and dropped to the ground. "Just to sink down in the green grass wet with rain was so heavenly," he said later. He might have stayed there—and died—but Purser Dorothy Kelly dragged him to safety.

Flash fires, dense smoke and a series of explosions wracked the stricken craft. Since the *Clipper* had been turning to its left, passengers on the right side had little chance. Unlike most air crashes, those seated up front were the lucky ones

*Pan Am officials insist Grubbs never made this statement and that it does not appear on tower tape transcripts. Grubbs, however, told at least one reporter that he had, indeed, said this. If so, it should show up on a cockpit voice tape.

this time. For many, going first class was worth their life.

A few in back made it. Seated in row 34, Mrs. Floy Heck of Leisure World sat in a stupor until her husband Paul ordered: "Floy, get up!" He led her to the wing. She jumped, injuring her legs, and could not walk. "I kept praying and asked Jesus to help me, and I kept crawling away." She did not see her husband again until they were reunited in a U.S. hospital.

As people toppled from the upper level to the first-class compartment below, the Royal Cruise Line's Naik felt a body hit his head. His wife was motionless and bleeding from the temple. A mound of burning metal blocked a path to the gaping fuselage. Twice Naik tried to carry his wife over the barrier. Once an explosion blew him back. A second hurled him onto the wing. He rolled off to earth, but his wife was thrown backward. Someone yelled at him: "Get out of there! It's going to blow!" Watching the flames in frustration, he saw a white shirt under the plane, rushed toward it—and pulled his wife away.

As always in such mass tragedies, there were countless "ifs." If someone had been seated just one row forward, he might have lived instead of died. If there had been no terrorist bombing at Las Palmas. If the KLM plane had not refueled, would its lighter weight have provided a lifesaving extra lift? If KLM had waited just 30 seconds more to take off. If Pan Am had moved a bit faster to its exit—or slower.

But for the tragic victims of Tenerife, there were no ifs. For their surviving families, the ifs were only agony. The reality came home at week's end in brown wooden boxes, flown to Holland and Delaware's Dover Air Force Base in cargo jets. Now it was up to the professional investigators to deal with both the ifs and the realities of aviation's worst disaster.

The Constant Quest for Safety

Could it happen again? Could two jetliners collide on another runway and produce a catastrophe to match the one that exploded at Tenerife? The experts will never say "Never," but the chances of such a recurrence are reassuringly slim. Tenerife was a freak accident at a minor airport, brought about by a chain of incidents, coincidences and human failures that are unlikely to occur again. As John McLucas, the outgoing head of the Federal Aviation Administration, told TIME Aviation Correspondent Jerry Hannifin, "We cannot say that it's impossible for a situation like Tenerife to occur in the U.S. But we can say we are doing everything possible to prevent such a situation—unless somebody screws up."

The record speaks for itself. In 1976 the U.S. airline industry had the safest year in its history. The 2,300 airliners flew 2.5 billion miles, carried 220 million passengers and had only four fatal accidents. The record low was in 1975, with three fatal accidents, but only 45 people were killed in 1976—compared with 124 the year before. Flying by commercial jet in the U.S. is now at least 15 times as safe per passenger-mile as driving in a car. The passenger who shows his ticket to the smiling stewardess and buckles himself into his narrow seat has a 99.999% chance of arriving at his destination safe and sound. Indeed, flying has become so routine that the notably pragmatic insurance companies charge pilots no more for policies than they do ribbon clerks.

In Western Europe and Japan, where the goal of reducing the possibility of human error is pursued with zeal and effectiveness, the safety record is also good. For the most part, major foreign airlines fly the same American-made planes as U.S. carriers—Boeings and McDonnell Douglas DC-9s and DC-10s. In Europe, particularly in France, Great Britain, West Germany and the other industrialized countries, airline technology is fully as sophisticated as it is in the U.S., and in some aspects the Europeans are more advanced. France, for example, uses a battery of jet engines to blast away fog from Paris' two inter-

national airports—De Gaulle and Orly. That technique has not been adopted in the U.S. largely because of the noise and the pollution it creates. Using their advanced instrument landing systems, the French and the British airlines operate under conditions that would shut down most American airports.

West Germany's excellent safety record has been compiled against overwhelming odds. The nation has the most dangerous airspace in Western Europe: 11,000 private, military and commercial flights a day—one every eight seconds—crisscross an area roughly the size of Illinois. What is worse, the coordination between commercial and military flights is so poor that Chancellor Helmut Schmidt has ordered a Cabinet study of the problem. In 1976 there were 221 "near collisions"—approaches close enough to terrify those who knew what had happened. Says a senior air traffic controller at Köln-Bonn airport: "It's like playing Russian roulette in the air." The fact that there have been no collisions in recent years is testimony to West Germany's wary pilots, sophisticated ground equipment and a superb group of air controllers, surely one of the most harassed contingents in a highly demanding profession.

Despite the hazards that Lufthansa faces daily, it has a safety record comparable to that of U.S. carriers, judged over the years. So do Finnair, Air France and SAS. Americans should also feel safe flying north of the border. Air Canada is considered one of the most professional airlines in business.

In large part, the vast improvement in air safety was brought about by the same factor that created the vast increase in air travel: the development of the jet airliner. Flying in a modern jet is ten times as safe as flying in the noisier and slower piston-engined aircraft of the mid-'50s. Over the years, airframes have become sturdier and engines not only much more powerful but more reliable. The Federal Aviation Administration and the airlines poured millions into developing better flight control equipment—sophisticated radars and navigation aids. Military inno-