

Aviators IG Interesting News #7 – 30,000 feet plunged over Pacific Ocean

#AviatorsIGFunFact: Airbus A380 has a maximum fuel capacity of 323,545 L.

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19 February 1985, China Airlines Flight 006 (CI 006) was cruising at 41,000 feet across the Pacific Ocean. It was a regular scheduled passenger flight between Chiang Kai-shek International Airport, Taipei, Taiwan, and Los Angeles International Airport, Los Angeles, United States of America. Operating the route was a Boeing 747SP with 251 passengers and 23 crew members on-board, which departed Taipei at 0022 (Pacific Standard Time, PST).



Figure 1: The Boeing 747SP (N4522V), operating the route from Taipei to Los Angeles.

10 hours into the flight time, just more than 500 km northwest of San Francisco, China Airlines Flight 006 encounter light clear air turbulence. Its autopilot and autothrottle mode began moving its throttle lever forward to maintain its cruise speed. However, the flight engineer noticed the performance level on engine 4 was out of the ordinary as the number 4 engine's instrument gauges were not responding to the throttle movements.

A few moments later, its airspeed started decreasing and the flight engineer told the captain that engine number 4 had flameout. In response to the sudden flameout, the flight crew decide to review the situation and activate the engine flameout checklist. The first officer request air traffic control for lower attitude due to malfunction of 1 engine. In the meantime, the flight engineer was being request by the captain to re-start engine 4 at 41,000 feet.

The attempt was unsuccessful as the maximum engine restart altitude is 30,000 feet. Air traffic control then cleared the flight to descend and maintain at 24,000 feet. The flight crew did not respond for the acknowledgement on the instruction and did not inform the air traffic control about the engine failure.

Air traffic control tried to establish six consecutive radio contacts due to failure of acknowledgment of instruction but to no avail. The airspeed dropped rapidly from 560 knots

to 240 knots, the captain decided to turn off the auto-pilot mode. As the auto-pilot mode was switch off, the airplane instantly banked 60 degrees to the right with the nose pitch downwards.

The captain and flight engineer insisted both the standby attitude director indicator (ADI) was malfunctioning. The airplane was then out of control and dived towards the Pacific Ocean. As the airplane descended rapidly, the captain tried to recover from the dive. The flight engineer realised that 3 other engines started to lose thrust. The captain then moved its throttle lever to maximum level while the flight engineer tried to re-light engine 4 again.

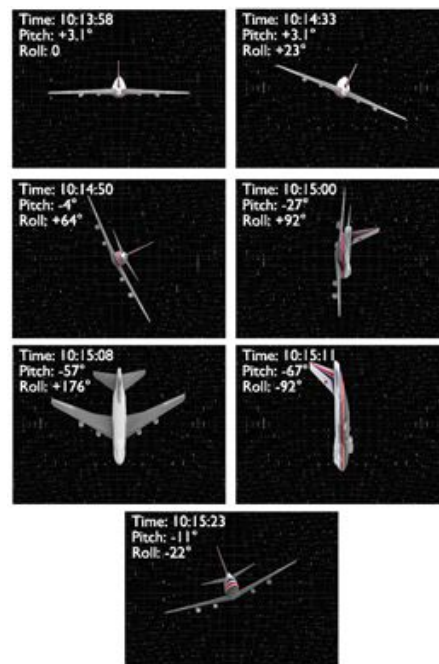


Figure 2: China Airlines Flight 006 bank, roll and pitch animation

As engine power increased, the airspeed increased and the airplane dove faster and faster. The aircraft experienced more than positive 5G (5 times the mass of an object), giving the flight crew a difficult time to recover from the dive and re-light the engine. The captain pulled the control column back and airplane began to decelerate rapidly. Although, the aircraft was out of the dive, the aircraft nose pitched up and was climbing rapidly.

Again, the aircraft suddenly experienced more than negative 5G, putting passengers and crew members back into the terrifying situation. However, the airplane could not maintain its climb as the airspeed goes slower and slower. After tumbling 10,000 feet from the skies, once again, the airplane dives back down, towards the Pacific Ocean.

During the dive, China Airlines Flight 006 indicated airspeed (IAS) continued to increase rapidly until it exceeded the airplane's maximum operating speed (V_{mo}). Excessive G-forces (up to 5.1G) tears two of the main landing gear actuator doors, parts of the horizontal

stabilizer had been ripped off, rupturing parts of the hydraulic system resulting the left elevator malfunction.



Figure 3: The damage caused by the upset during the 30,000 feet plunge.

The captain was unable to recover the airplane while it was in the clouds and was uncertain about his artificial horizon. At about 11,000 feet, the airplane emerged from the clouds. Based on outside visual references, the captain pulled the control column back again and the airplane decelerated. The flight crew began regaining control and was able to finally stabilize the airplane at about 9,500 feet.

The first officer and flight engineer noticed that the airplane attitude director indicator (ADI) and 3 of the engines (Number 1, 2 and 3) were back to normal. The flight engineer then tried to re-start engine number 4 and this time it succeeded. The flight crew contacted air traffic controller for an engine flameout and declared an emergency. Air traffic control cleared CI 006 to 20,000 feet and request an alternative diversion to San Francisco International Airport for the flight crew.

The flight crew decided to divert to San Francisco International Airport as part of the hydraulic system fluid level gauge indicated empty causing the landing gear to be extended. China Airlines Flight 006 re-declared emergency as 24 passengers and crew members were seriously injured. Air traffic control cleared the flight direct to San Francisco and to descend at "pilot's discretion." Fortunately, the flight landed successfully with 274 passenger and crew members survived an aircraft accident.

National Transportation Safety Board immediately began the investigation. After months of investigations, the conclusions were deemed astonishing. Engine number 4 did not flame out but had less throttle power. Due to different engine power setting, the aircraft started to roll to its right. The captain did not disengage the autopilot in a timely manner after thrust was lost on the No. 4 engine thus banking further and further. The flight crew failed to acknowledge and gave the necessary rudder input to counter the in-balance of thrust.

Human performance information was taken into consideration. Although the flight crews were given appropriate rest time before and within the flight, some of the flight crews;

especially the captain duty roster was quite hectic. Human fatigue or maybe even jetlag could affect the crew performance and operations of the China Airlines Flight 006. Due to meteorological factor, spatial disorientation was one of the factors that led the flight crew inability to interpret the aircraft horizon.

Photo sources:

Figure 1:

https://commons.wikimedia.org/wiki/File:China_Airlines_Boeing_747SP_Maiwald.jpg

Figure 2:

<https://commons.wikimedia.org/wiki/File:747-CA006-1.png>

Figure 3:

https://commons.wikimedia.org/wiki/File:Damaged_empennage_of_China_Airlines_Flight_006-N4522V.JPG

References:

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