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## **Loss of Situational Awareness during Commercial Flight Over Colombian Mountains**

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### **FLIGHT HISTORY:**

On March 27, 2018, an Airbus A 318 took off from Eldorado International Airport in the city of Bogotá (IATA: BOG - ICAO: SKBO) with destination Alfonso Bonilla Aragón International Airport in the city of Cali (IATA: CLO - ICAO: SKCL) with 75 passengers, 4 cabin crew members and 2 pilots. The aircraft was scheduled to depart BOG at 21:25 local time and land at CLO at 22:33.

According to the Operator's information, the First Officer (PF) was conducting Initial Operational Training in the right seat. The flight commander was a senior captain and Instructor Pilot serving as Pilot Monitoring (PM) in the left seat.

During the descent phase in a Standard Terminal Arrival procedure (STAR) and when the aircraft was about 40.5 miles from Cali VOR, the Ground Proximity Warning System (GPWS) was activated. The aircraft was descending to an altitude of 13,980 feet, falling below the established MEA of 17,000 feet. The flight commander performed the corresponding evasive maneuver, immediately climbing to 20,640 feet, exceeding the authorized flight level.

The ATC Radar Minimum Safe Altitude Warning system (MSAW) at Cali had a visual and aural terrain proximity alert system; however, the audio system was down due to configuration problems. Even so, the visual alert AW (Altitude Warning) was activated on the radar screen display when the aircraft left the MEA on R564 but the situation was not noticed by the CLO Approach Controller; the pilot deviation and subsequent evasive action were also not reported by the flight crew to ATC.

An analysis of the radar video recordings revealed that the radar return signal and Mode C on the radar screen disappeared at 38.5 NM, shortly before the aircraft crossed 14,000 feet on its descent. Moments later, the radar signal and Mode C reappeared on the controller's radar display, showing the aircraft at 19,400 feet.

Subsequently, the aircraft resumed the arrival procedure (MANGA8) and landed on RWY 02 at the Alfonso Bonilla Aragón Airport in Cali without further incident.



Location of GPWS alarm activation over mountainous terrain

## HUMAN FACTORS

Loss of Situational Awareness (SAW) by the crew, by wrongly programming a descent altitude limit established in the MANGA 8 arrival procedure, not noticing the error and descending below the MEA on mountainous terrain; this circumstance brought the aircraft closer to the ground and triggered the GPWS "PULL UP, TERRAIN" alarm.

The investigation on this case revealed that first officer who was flying the aircraft at that time had wrongly programmed 14,000 ft on the STAR MANGA 8 route when the level established by the MEA was 17,000 ft.

On the other hand, the Pilot Monitoring (PM) did not notice this situation until the moment when the GPWS "pull up - terrain" was activated, forcing him to take command of the airplane and perform an evasive maneuver with a steep climb and ending above the authorized flight level 20640 feet.

There was a lack of assertive communication between both pilots, given that when programming the FMS, the arrival procedure was not crosschecked and was not verified and

confirmed by both of them. The lack of supervision by the PM to his First Officer (PF) whom, due to his little experience and while being in training stage should have been under strict control and feedback (**CRM**).

The Flight Commander's actions – Aeronautical Decision Making (**ADM**) - were quick and appropriate after hearing and verifying the GPWS alarm, managing the situation according to the **TEM** model for threat and error management and prompting a maneuver which avoided an Undesired Aircraft State (**UAS**).

#### CORRECTION OF BAD PRACTICES

- Errors in the selection of altimetry adjustment.
- There was no cross-check between the PF and PM.
- Human - Machine interface (automation).
- Overconfidence.
- Direct effort to important tasks 80/20.
- Instruction and Training.

#### CORRECTIVE ACTIONS – AIRLINE

- Two periods of flight simulator with emphasis on the following topics:
  - GPWS Memory items.
  - EGPWS use and modes.
- LOFT with a scenario for the correct application of procedures in the vertical handling of the aircraft and descent calculations, as well as workload management.
- Cockpit Systems related to terrain. MEA – MORA - MOCA.
- Cockpit Systems related to position of aircraft.

#### PROBABLE CAUSES:

- Flight Crew's Loss of Situational Awareness (SAW).
- Not verifying the descent restrictions established in the MANGA 8 STANDARD ARRIVAL PROCEDURE.
- Performing a continuous descent ("**Open Descent**") and not noticing the error while descending below the MEA over mountainous terrain; this action

brought the aircraft closer to the ground and triggered the activation of the GPWS with the call out «PULL UP, TERRAIN»

- Occurrence Category - Serious Incident
  
- TAXONOMY ICAO:
- CFIT - Controlled flight into or toward terrain.
- NAV - Navigation error.
- ATM - ATM / CNS - Air Traffic Management (ATM) / Communication, navigation, or surveillance service (CNS).

#### LESSONS LEARNED:

- Citing Captain Enrique Piñeiro, producer of WRZ a documentary film, HUMAN ERROR is an inherent part of human nature; and one of the defenses to minimize it, is to generate mechanisms that would detect it at an early stage to break the chain and prevent it from setting up an accident or incident because of it.
- Improve the SOPs: in this case, the airline updated its procedures in IOE cases.
- Factors to consider:
  - Human physiology
  - Flying discipline
  - Training - TEM
  - Technology interface
  - Technical briefing SOPs
  - Crew-ATC communication
  - Workload
  - Judgment and criteria.