TAME Embraer 190 at Quito on Sep 16th 2011, overran runway

Aviation Herald report

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A TAME Embraer ERJ-190, registration HC-CEZ performing flight EQ-148 from Loja to Quito (Ecuador) with 97 passengers and 6 crew, landed on Quito's runway 35 in rain at around 19:00L (00:00Z Sep 17th) but could not stop on the runway. The aircraft went over soft ground, through the localizer antenna and came to a stop at the airport perimeter wall about 275 meters/900 feet past the runway end. 4 people received minor injuries, the aircraft received substantial damage.

Ecuador's Accident Investigation Commission JIA have released their **final report in Spanish** concluding the probable cause of the accident was:

the crew's decision to continue the approach and landing without actioning the relevant checklists (EMERGENCY AND ABNORMAL Procedures), that were required for malfunctions of the slat/flap systems by the Quick Reference Handbook, resulting in too long a landing.

The aircraft and crew had been scheduled to fly the sectors Loja-Quito-Cuenca-Quito that evening. There had been discussion between the captain and dispatch, the captain argued that the sector Quito-Cuenca-Quito should be flown by another crew which was turned down.

The departure from Loja had been delayed by 46 minutes, past the official opening hours of that aerodrome. With the permission of the head of the aerodrome the aircraft departed, the crew took the decision to depart due to the subsequent sectors to be flown. The aircraft departed Loja with 4000kg of fuel on board, 1626 kg of fuel was planned for the sector Loja-Quito, 1013 kg for the diversion to the planned alternate aerodrome Manta and 1265 kg of reserve fuel.

The captain (55, ATPL, 6,160 hours total, 1,879 hours on type) was pilot flying for the sector, the first officer (51, CPL, 4,891 hours total, 2,807 hours on type) was pilot monitoring.

Following an uneventful departure and cruise the aircraft was vectored onto the ILS approach for Quito's runway 35. The crew was instructed to reduce speed to 230 KIAS while being vectored towards the final approach and further instructed the aircraft to reduce to minimum approach speed due to separation to the preceding aircraft, the crew selected the flaps to the landing configuration but received indication that the slats remained retracted and the flaps only moved to position 2. The crew attempted to reset the flap system 5 times, however without success, and decided to continue the approach, but did not work the related abnormal checklist procedures, for example the crew did not compute their reference speed and landing distance required in view of the slat failure.

The captain indicated to the first officer he wanted to lower the gear as late as possible voicing concern about the fuel situation, at that point the aircraft had consumed 1730kg of fuel (planned 1626kg). About 3.5 minutes after encountering the first trouble the crew reported established on the localizer and was handed off to tower, the crew switched to tower frequency and reported on tower frequency over the outer marker.

Tower instructed to continue the approach, winds were calm, the runway was wet and instructed to report runway in sight. The crew inquired about their separation to the preceding A320, tower replied that his radar was out of service, 30 seconds later the tower reported the A320 had landed and another 30 seconds later the A320 had vacated the runway.

The crew reported they had the runway in sight and were cleared to land on runway 35, winds were calm, braking action average, after that transmission was acknowledged the tower instructed the crew to turn on their landing lights. The flight data recorder identified the main wheels touched down 880 meters/2900 feet past the runway threshold, overran the end of the runway, travelled past the runway end safety area of 166 meters/540 feet, took down 6 of the 14 the localizer antennas and broke through the aerodrome perimeter wall knocking down 19 meters of the wall before coming to a stop about 300 meters/1000 feet past the runway end.

The tower controller had watched the landing and pressed the crash button immediately when the aircraft went past the runway end. Emergency services responded and reached the aircraft 50 seconds after the aircraft came to a stop. The aircraft spilled fuel from the wing tanks, emergency services therefore foamed the aircraft. The occupants of the aircraft were evacuated via the 2L and 2R slides. The forward left slide did not inflate and the safety pin could not be removed, the forward right slide was blocked by a housing wall although it had normally inflated. Slide 3R could not be used due to obstacles.

6 crew and 5 passengers received minor injuries.

The aircraft received substantial damage including fracture of the left and right main gear struts, displacement of the nose section due to impact with the wall, the main wheel tyres received cuts as result of impact with the wall.

In addition to the damage to 6 of 14 localizer antennas and destruction of 19 meters of aerodrome perimeter wall the wall of a house's living room below the final position of the aircraft was damaged over a length of 9 meters.

The JIA stated that with landing flaps applied the landing distance required would have been 880 meters at a Vref of 119 KIAS for the present weight of the aircraft and environmental conditions. However, with the flaps extended only to position 2 and slats remaining retracted, the Vref would have been 149 KIAS and the landing distance required would have been 1940 meters (runway length 3125 meters, elevation 9230 feet).

The aircraft however crossed a point 80 meters before the runway threshold below 50 feet AGL at a speed of 163.8 KIAS, the main wheels touched down 880 meters past the runway threshold about 9 seconds later, the spoilers deflected 950 meters past the threshold, the thrust reversers deployed 1280 meters past the threshold and the brakes were operated 1660 meters past the threshold, full brakes were applied 2300 meters past the threshold with antiskid modulating the brakes pressure correctly. Due to the 15 knots higher approach speed than Vref, the long flare and the late application of the brakes the needed landing distance was significantly longer than 1950 meters.

The JIA analysed that despite the higher fuel burn encountered on the way to Quito there was still sufficient fuel on board to divert to Manta following a go-around from low height and arrive in Manta above final fuel reserve (editorial note: sum up the planned fuel figures, sum is 3904 kg!) and indicated that according to cockpit voice recorder the fuel meters even read 4070kg of fuel on board at the time of departure from Loja.

The JIA established that all brakes were functioning normally and were no factor contributing to the accident.

According to the computerized maintenance logs of the aircraft there had been 53 cases of slat failure indications since July 19th 2011 to the date of the accident, 6 on approach, 47 enroute. 3 of the events were on the accident date. The JIA queried the efficiency of the corrective actions taken and reported that all 16 slat actuators were taken to the manufacturer's facility for testing.

These tests showed that two actuators, 5 left and 6 right, did not rotate freely due to binding with the other 14 rotating without binding. These two actuators also failed the cold testing after being exposed to -40 degrees C over night. Moisture was detected inside 3 of the actuators, including 5L and 6R, following disassembly. A 4th actuator contained rust coloured grease. Actuator 6R was re-assembled using new grease and subsequently tested successfully, without any binding or torque issues.

Slide 1L was tested, with the door armed and opened it did not inflate. After removing the decorative cover the safety pin was found still installed, although the maintenance manual required the safety pin removed before that cover is being installed.

The JIA thus analysed that the crew did not work the relevant checklists after encountering the slat failure, did not abort the approach although the stabilized approach criteria were never met, and applied brakes late and irregular thus preventing the aircraft to stop within the shortest landing distance possible. The crew was under significant discomfort and stress, especially the captain following the argument with dispatch and the delay in Loja, their performance was therefore impaired. The JIA stated: "the human factor, including a good deal of time spent during flight in conversation about these issues unrelated to the conduct of the flight, was a dominant factor into the accident sequence leading to loss of situational awareness and inappropriate decision making".