

Keflavik,
Iceland



Edinburgh,
Scotland

The augmented flight crew elected to take their rest breaks in the cockpit of the Boeing 737-800 rather than in the on-board rest facility that had been provided for the round-trip flight between Iceland and Turkey — a journey that was prolonged by delays and the unexpected need for an en route fuel stop. The cockpit provided an unsuitable environment for rest, and the pilots likely were tired when they conducted the last approach and landing of the long day, according to the Aircraft Accident Investigation Board (AAIB) of Iceland.

The board's final report on the incident said that fatigue was reflected in the crew's performance during the approach and landing at Keflavik. With little or no flare, the aircraft bounced on touchdown. The wheel brakes were applied late, and reverse thrust was not used to its full effectiveness. The surface conditions at the end of the

Too Long at the Wheel

BY MARK LACAGNINA

Fatigue factors in a runway excursion.



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Nearing Keflavik, the pilots of this 737 commented on how long the day had been and how tired they were.

runway were worse than expected, and the crew turned the 737 onto the final taxiway to avoid an overrun.

“The aircraft skidded off the taxiway and came to rest parallel to the taxiway with the nose landing gear and the right main landing gear off the paved surface,” the report said. No one was hurt, and damage was minor.

Pointing to the fatigue-related errors identified during the investigation, the board called on authorities to ensure that operators provide adequate crew rest facilities when required and to develop guidance for implementing fatigue management systems.

The incident flight was conducted on Oct. 28, 2007, by JetX under a wet-lease agreement with Astraeus. The flight plan called for the 737 to depart from Keflavik at 1005 coordinated universal time (1005 local time) for the positioning flight to Antalya, arriving at 1600 (1800 local time) and departing at 1700 for a 2320 arrival in Keflavik.

The estimated duty period was 14 hours and 15 minutes, which necessitated the augmented flight crew. The commander, 39, had 6,132 flight hours, including 976 hours in type. The “augmented” (relief) commander, 41, had 5,850 flight hours, with 1,590 hours in type. The first officer, 28, had 2,949 flight hours, including 365 hours in type.

The pilots reported for duty at 0905. They received a message from a duty officer for ScanOps, the contracted flight-planning service for JetX, that 189 passengers were expected for the 2,616-nm (4,845-km) flight from Antalya to Keflavik. “Due to strong headwinds, the duty officer advised that carrying all the luggage could pose a problem,” the report said. “If so, and if flight and duty time limitations allowed, he suggested that a fuel stop would be preferable to offloading luggage.”

The JetX flight operations manual set a 16-hour duty limit for an augmented flight crew. Two landings were allowed during the duty period; a third landing could be conducted only with permission by the Icelandic Civil Aviation Administration (CAA). Among the requirements for permitting a third landing was the *availability* of approved crew rest facilities aboard the aircraft.

At the crew’s request, ScanOps developed another flight plan for the return flight, with a fuel stop in Edinburgh, Scotland, and obtained permission from the CAA for the third landing.

Behind Schedule

The 737 departed from Keflavik at 1056 — 51 minutes late. “During preparations for departure, the crew was delayed because the auxiliary power

Antalya,
Turkey



Groundspeed was 35 kt when the pilots turned left off of Runway 02 onto the final taxiway.

unit was inoperative and they had to have the engines airstarted,” the report said. “During startup an igniter failed, causing further delays.”

The designated crew rest facility comprised a row of three adjacent seats at the rear of the cabin, partitioned by a curtain. The relief commander did not use the facility while the commander and first officer conducted the positioning flight to Antalya. He remained in the cockpit and participated in planning the return flight.

The 737 arrived in Antalya at 1634 — 34 minutes later than planned. The crew was informed that filing the new flight plan with Turkish authorities might take up to four hours. “Upon consultation with a duty officer at ScanOps, the flight crew decided to take off with their original flight plan and, once en route, divert to Edinburgh to make a fuel stop, to avoid further delays,” the report said.

The actual passenger count was 187 plus one infant — or one passenger more than can be accommodated with three seats reserved for crew rest. “The

commander made the decision to carry the extra passenger and made a note that the passenger would have to sit in a cabin crew seat during cruise,” the report said. “In fact, the passenger sat in the crew rest area from Antalya to Keflavik.”

The aircraft departed from Antalya at 1810 — one hour and 10 minutes late. The relief commander and the first officer were at the controls. The commander took his rest break in the cockpit.

The 737 arrived at Edinburgh at 2313 and departed for the final leg to Keflavik at 2345. The standby commander was the pilot flying (PF), and the commander was the pilot monitoring. The first officer remained in the cockpit.

Inadequate Facility

The pilots told investigators that they considered the crew rest facility to be inadequate. “The crew felt that the cockpit provided a more suitable resting environment,” the report said. “The crew could recline in their seats, stretch out and were separated from

passengers by a door rather than a simple curtain.”

About 40 minutes from Keflavik, the senior cabin crewmember entered the cockpit and asked the pilots how they were doing. “The flight crew answered that they were really tired and commented on how long the day had been and how tired they were,” the report said.

The commander listened to the Keflavik automatic terminal information service broadcast, which said that weather conditions at 0100 included surface winds from 270 degrees at 5 kt, visibility greater than 10 km (6 mi), a few clouds at 4,000 ft, temperature 0° C (32° F) and dew point minus 3° C (27° F). The following information was provided for Runway 11/29: “Braking action good, occasional ice patches. Braking action taxiways and apron medium/poor, sanded.”

The pilots discussed the surface winds, and the PF said that they would request Runway 02 if the wind velocity remained less than 10 kt. The report noted that Runway 11/29 and Runway 02/20 are more than 3,000 m (9,843 ft) long but provided no information about the runway safety areas.

When the commander requested, and received, radar vectors from Reykjavik Control toward Runway 02, he did not ask for a braking action report for that runway. Keflavik Approach cleared the crew to conduct the instrument landing system (ILS) approach to Runway 02. “During the briefing for the approach, the PF mentioned that the taxiways to the terminal would be slippery but the runway would be good,” the report said.

Callouts Omitted

The pilots omitted several required calls during the descent, including the callout at Flight Level 100. The PF did not respond to the commander’s callout

at 2,500 ft radio altitude and did not identify the radio frequency set for the ILS. “The reason for the missed callouts remains unexplained and could possibly be attributed to fatigue,” the report said.

Noting that a cabin crewmember occupied a cockpit jump seat during the descent and approach, the report said that “there were distractions in the cockpit, and the mood was relaxed.”

The crew flew the approach with the autopilot, autothrottles and auto speed brakes (ground spoilers) engaged, but they did not engage the autobrakes. Landing reference speed (V_{REF}) was 148 kt.

The last friction measurement on Runway 02 was made at 2312. A SNOWTAM (snow warning to airmen) issued shortly thereafter indicated that the runway was contaminated with ice and that the measured friction values were 69 for the first third of the runway, 71 for the second third and 45 for the final third. (Lower values are associated with less effective braking action.)

When a Keflavik Tower controller cleared the crew to land on Runway 02, he said that the winds were from 320 degrees at 5 kt and that braking action was “good-good with the occasional ice patches.” The controller told investigators that he had no explanation for using the term “good-good”; he said that he normally reports braking action using measured friction values, as required by the airport authority.

No Extra Precautions

“The information on the runway and taxiway conditions that the PF received led him to expect that no extra precautions would be necessary during the landing,” the report said. The crew also had no indication that the surface conditions on the last third of the runway were deteriorating.

About 18 minutes before the 737 was landed, the airport surface condition analyzer generated a frost pavement condition warning because the dew point had increased above the runway surface temperature. “At the time of the frost warning, all the airfield services staff were outside the office working on runway maintenance, and the system was not being monitored,” the report said.

The crew omitted the required callout when the aircraft crossed the outer marker. They disengaged the autopilot and autothrottles while descending through 575 ft above ground level. “On short final, the crew used the precision approach path indicator (PAPI) lights as a visual approach slope indicator as well as the runway lighting,” the report said.

Surface winds were from 318 degrees at 7 to 10 kt at 0155 when the 737 touched down on Runway 02 at 150 kt. “The aircraft contacted the runway and then bounced up into the air again before full runway contact was made with the main landing gear tires followed by the nose landing gear tire,” the report said.

Recorded vertical accelerations were 2.13 g — that is, 2.13 times standard gravitational acceleration — on the first touchdown and 2.01 g on the second touchdown. The report said that the flight crew “channelized into analyzing the reason behind the hard landing instead of focusing on the deceleration of the aircraft.”

The ground spoilers had deployed after the first touchdown, and the crew engaged the thrust reversers after the second touchdown. “Reverse thrust was initially increased to 73 percent N_1 [engine fan speed] for approximately seven seconds, then reduced to idle thrust decelerating through a groundspeed of 110 kt and approximately 4,000 ft [1,219 m] down the runway,” the report

said. “Thrust reversers remained deployed and at idle power [until the 737 neared the end of the runway].”

The wheel brakes initially were applied about 46 seconds after the second touchdown, when the aircraft was about 1,500 ft (457 m) from the end of the runway with a groundspeed of 72 kt.

Groundspeed was 35 kt when the crew began to steer the aircraft left onto Taxiway N-4. They increased reverse thrust to 80 percent N_1 to help slow the 737. “The aircraft came to rest on a final heading of 288 degrees with the right main landing gear and nosewheel off the paved surface of Taxiway N-4,” the report said.

The nosewheel had been slightly damaged during the excursion. The crew kept the left engine running until a ground power unit was connected. “There was no need to evacuate the aircraft immediately, and the passengers stayed on board until buses were brought by the airport authority to bring them to the terminal building,” the report said.

The pilots were on duty for 17 hours and 20 minutes — more than three hours beyond the expected duty period. The report said that although current regulations allow an augmented flight crew to be on duty for as many as 19 hours under unforeseen circumstances, they “do not restrict the number of hours of wakefulness or prescribe a minimum number of hours of restorative sleep.”

Based on the findings of the incident investigation, the AAIB called on the European Aviation Safety Agency to modify the flight and duty time regulations. ➔

This article is based on AAIB Iceland “Report on Serious Incident, Runway Excursion, M-03707/AIG-19; JetX; Boeing 737-800, TF-IXF; Keflavik, Iceland; October 28, 2007.”