

Final Report

EX005-0/98
April 2000

Factual Information

Kind of occurrence:	Serious incident
Date:	02 April 1998
Location:	Braunschweig
Aircraft:	aeroplane
Manufacturer/type:	Dassault / Falcon 20
injuries to persons:	no injuries
material damage	aircraft not damaged
other damage:	none

History of the flight

On an IFR flight from Pamplona (LEPP, Spain, time of departure 14:47 hrs UTC) the aircraft was in an approach to Braunschweig Airport (EDVE) guided by Hannover RADAR. Then by RADAR the aircraft had been cleared for an LLZ-DME approach RWY 26 and finally after stabilization on the Localizer RWY 26 the crew had been requested to contact Braunschweig Tower (TWR) for the purpose of landing. With the subsequent landing clearance pressure QNH 1002 hPa and wind 140°/2 kt were notified. Due to the increasing twilight and the overall hazy visual conditions (ground visibility 6 km), the precision approach path indicator (PAPI) had already been switched on. At approximately 16:55 hrs UTC the aircraft touched down on RWY 26 about 280-330 m behind the threshold 26 (THR 26). After normal deceleration at first, the aircraft could not be decelerated enough. When the crew tried to leave the runway via the last taxiway (TWY C), the aircraft overshot RWY 26 after about 1080 m to the left slightly sideslipping and stopped af-

ter about 20 m in the adjoining soft ground of the safety strip. There were no injuries to persons nor damage to the aircraft.

Investigation

Shortly after the occurrence, two staff members of the BFU (FUS at the moment of the serious incident) started the investigation. In accordance with ICAO Annex 13, the Spanish investigation authority, COMISION DE INVESTGACION DE ACIDENTES E INCIDENTES DE AVIACION CIVIL, was informed about the occurrence. With their assistance it was possible to contact the operator and the competent maintenance organization in Spain. The aircraft was properly certificated and was used by an operator in accordance with ICAO Annex 6 to fly cargo by order to Braunschweig. After a provisional inspection of the braking system on the next day, the aircraft was cleared for a ferry flight to a maintenance organization in Spain.

With the beginning darkness it was no longer possible on the day of the incident to secure the skid and taxi marks on the wet surface of the runway. Only under day light conditions and with the runway surface dried off sufficiently the marks could be traced back, however, only by about 130 m. It became obvious that the attempt yet to steer the aircraft towards TWY C, a change in direction of about 40° had been achieved, had already produced a sideslip of up to 7° to the right.

As a result of rain that had fallen approximately three hours before, the runway was at least humid at the moment of the landing. Isolated short time drizzle showers having additionally moved over Braunschweig Airport had contributed about this. Thus a certain humidity or wetness had remained on the runway. The relevant METARs of 16:20 hrs and 16:50 hrs UTC did

not contain any information about rain or drizzle. However, rain (RA) at 13:50 hrs UTC and slight drizzle (-DZ) at 14:50 hrs UTC had been observed by the meteorological service/air traffic control Braunschweig.

According to the statement of the flight crew, the braking action first was normal after touch down, but became less during the further roll-out. Even actuating the brakes simultaneously by both pilots at last, until the aircraft stopped, produced no improvement. The brake system I and 'anti-skid on' had been activated. Inspections of the braking system by technical staff members of the operator in Braunschweig as well as by the maintenance organization later on in Spain did not reveal any technical defect of the system. Only one brake was worn to such a degree that it had to be replaced subsequently. The tires did not show any traces of hydroplaning or remarkable wheel lock. The extent to which the braking characteristics of the tires of this Falcon 20 had been affected by wetness had not been investigated. A subsequent determination of the deceleration coefficients for the runway, e.g. by tapley meter, was not made.

The flight data recorder installed was not in a serviceable condition and thus was not evaluable.

The flight path down to 100 ft GND could be reconstructed only by means of the radar data of DEISTER RADAR. From this it was to be concluded that the final approach (LLZ-DME approach) down to this point had been assisted by PAPI 26. The approach speed was between 140 and 155 kt CAS including minimum influence by the wind 140°/2 kt. The touch down could not be monitored by Radar, however, witnesses had observed that the touchdown point was 280-330 m behind THR 26. Thus the touchdown point had been farther inwards from THR 26 than planned by PAPI 26 located at 161 m.

According to the evaluation of the Airplane Flight Manual (AFM) the actual landing mass of 9860 kg (21740 lbs) required an approach speed (FAR 25.125) of $V_{REF}=127$ kt CAS (125 kt IAS) which corresponded to the crew statement concerning the approach speed selected. For dry, even runways with standard temperature and an actual pressure altitude of 600 ft the associated so-called demonstrated landing distance dry (DLD dry) was 795 m (2600 ft) extended to a maximum of 810 m (2650 ft) under the influence of the indicated wind.

The crew's flight planning documents concerning a calculation of the landing distance required were not submitted. The operationally required field length deduced from the AFM data with the other conditions unchanged was 1325-1350 m (4340-4425 ft). In the absence of specific data in the AFM globally a further extension by 15% to 1525-1550 m (5000-5090 ft) was to be taken into account for wet runway surfaces.

According to the AIP Germany a landing distance of 1380 m (4528 ft) was available for the landing (landing

distance available / LDA), starting from a point 50 ft above the threshold THR 26. Years ago the latter had been moved inwards by 180 m from the actual runway end due to local conditions so that the total runway length of 1560 m was not at disposal for landings on runway 26.

The flying experience of the pilot-in-command (ATPL) on this aircraft type was approximately 4000 h including 107 h within the preceding 90 days. The co-pilot (CPL) had accumulated 173 h within the preceding 90 days with a total flying experience of 400 h on this type. In addition the crew had already conducted landings at Braunschweig in the past, however, it could not be clarified under which meteorological conditions.

Analysis

The effects of the actual approach speed of 140-155 kt CAS could be reconstructed only by approximation, since such data were not contained in the AFM. Supposing that the descent would be continued on a 3° glide path until touch down the actual landing distances (dry, comparable to DLD dry) were extended to a minimum of 900-1050 m and expressed as field length to 1500 to 1750 m. Thus a landing e.g. in accordance with the operational requirements FAR 121.195(b) / FAR 135.385(b) or JAR-OPS 1.515(a) was possible only on a dry runway and with keeping the approach speed of 125 kt IAS, however, it was not possible any more on a wet runway in consideration of FAR 121.195 (d) / FAR 135.385 (d) or JAR-OPS 1.520.

Ignoring the operating limitations specified in the a.m. regulations and under optimum conditions and with the appropriate flying experience, a landing on a dry runway seemed to be technically just possible even with the clearly increased approach speed. But this would have required a touchdown point close to PAPI 26 and not, as in this case, close to the 1000 ft-point. Further conditions caused by the humid runway surface could not be calculated and evaluated since the essential instrument to assess the deceleration performance and to assist the flight path reconstruction, the required flight data recorder, was not serviceable. ICAO Annex 6, Pt. 1, Ch. 6.3 provides for regular maintenance actions to ensure reliable operation of the flight data recorder.

The individual short drizzle showers having occurred after the heavy rain but in the period prior to the landing were not recorded as a relevant meteorological observation and thus did not release a METAR message or a precautionary information to the crew. Apparently the restricted deceleration characteristics of RWY 26 at the time of landing were not obvious to TWR. However, the runway was at least humid at the time of landing and thus the runway braking characteristics had changed. On its own initiative, the flight crew had

not requested such an information during the approach, even though according to an equivalent flight planning, rain in Braunschweig must have been known to them, and thus a wet runway could not be excluded there which would have required an approach to an appropriate alternate aerodrome, (ICAO Annex 6, Pt. 1, Ch. 4).

On the basis of the flying experience a skilled flight crew familiarized with the handling of the Falcon 20 was to be expected. However, it was to be started from the fact, that the crew was not in a position to definitely assess the effects of the increased approach speed and the humid runway surface, because the AFM does not contain specific data and the runway conditions perhaps were unknown to them or not recognizable respectively. Possibly a calculation of the landing distance and the consideration of an alternate aerodrome for the landing were not a constituent part of the flight preparation. — In view of the reconstructed approach and relatively late touch down 280-330 m behind THR 26, due to increased approach speed, obviously the a.m. influences had not been accounted for in any way. Thus it is imaginable on the same basis, that the knowledge of the usual deceleration characteristics of the aircraft, a certain detrimental routine and the pressure to efficiently carry out the actual transportation task had contributed to the decision to continue the

approach in this way or to conduct the landing at any rate in Braunschweig.

Conclusions

The serious incident was attributed to the fact that because of too high approach speed the landing had not been discontinued. A contributing factor was the touch down which was relatively late under these special circumstances, so that in conjunction with the humid runway the deceleration of the aircraft had not been sufficient to stop it in time. For this landing possibly nobody had expected a runway detracted from humidity.

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field investigation	Krupper, Brunner, Büttner