**No: 2/92** **Ref: EW/C91/10/4** **Category: 4**

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| **Aircraft Type and Registration:** | Douglas DC-8-55F, Z-WSB |
| **No & Type of Engines:** | 4 Pratt and Whitney JT3D-3B turbofan engines |
| **Year of Manufacture:** | 1965 |
| **Date & Time (UTC):** | 31 October 1991 at 1327 hrs |
| **Location:** | Runway 26L, London Gatwick Airport |
| **Type of Flight:** | Public Transport (cargo) |
| **Persons on Board:** | Crew - 5 Passengers - None |
| **Injuries:** | Crew - None Passengers - N/A |
| **Nature of Damage:** | New tyres & brakes required on left main landing gear |
| **Commander's Licence:** | Airline Transport Pilot's Licence (Zimbabwe) |
| **Commander's Age:** | 49 years |
| **Commander's Flying Experience:** | Approximateley 7,000 hours (of which some 3,000 were on type) |
| **Information Source:** | AAIB Field Investigation |

## History of the Flight

On the day before the incident the aircraft flew uneventfully from Amsterdam to Gatwick. At Gatwick it was prepared for a non-stop cargo flight to Zimbabwe which was to be flown by a crew that had been resting at Gatwick for three days prior to the incident. Two other members of the operating company were on board as supernumary crew on this flight. The take-off weight was 141.2 tonnes which was 4.9 tonnes below the performance take-off weight limit and the aircraft's centre of gravity was well within the permitted range for its loaded weight. On preparing the aircraft for flight, the operating flight crew of three (commander, first officer and flight engineer) discovered that the flight control gust locks were not engaged. They were unable to re-engage the locks because the aircraft was parked with its tail into a strong southerly wind but the flight controls appeared to be undamaged. Apart from the unlocked controls, preparations for flight continued normally and the aircraft taxied for runway 26L. Normal 'full and free' flight control checks were carried out whilst taxiing and the aircraft was configured for a 15° flap take-off. Decision speed ($V_1$) was calculated to be 138 knots; rotation speed ($V_R$) was to be 155 knots and the crosswind limit for take-off was 25 knots.

The commander, who was the handling pilot, lined up for take-off and the flight engineer advanced the throttles to above 1.50 EPR (engine pressure ratio) which armed the take-off configuration warning system. The warning horn sounded and so the commander abandoned the take-off from minimal forward speed. After informing ATC of his predicament he taxied clear of the runway at the first exit and then investigated the cause of the configuration warning which, on this aircraft, could be triggered only by the parking brake, incorrect flap or spoiler deployment. The crew checked that the flaps were at 15° and that the inboard spoilers were locked closed. Finding nothing amiss, the commander ordered that the engines be advanced to 1.50 EPR once again. This time the configuration warning horn did not sound and he decided to attempt another take-off.

At 1326 hrs the aircraft was again cleared for take-off and, initially, the take-off run commenced normally. However, as power on numbers 1, 3 and 4 engines increased to the target of 1.88 EPR the flight engineer observed that the no. 2 engine EPR was excessive. He called out "EPR" which was acknowledged with a call of "OK", retarded the no. 2 throttle and compared the no. 2 engine indications with readings from the other engines. From this comparison he suspected that the no. 2 engine EPR reading was defective. He advanced the throttle to match the no. 2 N1 RPM reading with that of the other engines. With the N1s matched, the no. 2 engine N2 RPM and EGT readings were similar to those of the other engines. On that basis the flight engineer did not call for the take-off to be abandoned because he was satisfied that no. 2 engine was producing take-off thrust.

Meanwhile the commander, who was controlling the aircraft by rudder and nose-wheel steering, perceived that the amount of directional control required to keep the aircraft aligned with the runway was significantly more than he considered appropriate for the reported crosswind. At about 100 knots he released the nose-wheel steering and took control of the elevators and ailerons from the first officer. Shortly afterwards, when he attempted to raise the nosewheel clear of the runway, he perceived that the aircraft's response to elevator control inputs was abnormal and that the amount of left rudder was excessive for the prevailing conditions. He decided to abandon the take-off and initiated the appropriate drills by calling "stop". The drills were actioned by all three crew members and the aircraft decelerated rapidly from its peak airspeed of between 135 and 140 kt. No RTF call of abandoning the take-off was received by the air controller but he saw smoke issuing from the DC-8's landing gear and speedily instructed traffic on finals to go-around. At about the same time the ATC watch manager initiated emergency action since, at that stage, it seemed probable that the aircraft would over-run the runway.

The commander was able safely to vacate the runway via the last high-speed exit and bring the aircraft to rest on the standby runway (26R). The fire section attended the aircraft which was chocked in-situ whilst the wheelbrakes cooled; during this process two tyres on the left main gear deflated when

fusible plugs melted. After the wheels had cooled to a safe temperature, two deflated tyres were replaced and the aircraft was towed to the cargo area for a full check of the wheels and flight control systems.

## Engineering Investigation

The aircraft was off-loaded and examined by an engineer from the operating company. Each landing gear wheel and its brake unit was assessed for condition and wear. All the units on the left main gear were serviceable but all those on the right main gear were changed. There was no damage to the nose gear but the oleo extension was found to be low and this was rectified.

The DC-8 has a manually operated elevator which is positioned by servo tabs. There have been at least two previous occurrences of serious damage to the elevator control mechanism when the type has been parked in strong wind conditions without the gust locks engaged. One of these occurrences had befallen the operating company and another was documented in the flight manual. With this problem in mind, the commander had asked for a full check of the flight controls.

Control surface checks were carried out and checks of the flap, stabiliser, elevators, ailerons, spoilers, rudder, gust lock and nose-wheel steering systems revealed no defects. The aircraft was declared fit for service and it departed Gatwick the next day with the incident crew at the controls. When the aircraft arrived at its company's main base a scheduled no. 3 engine change was performed and insect debris was removed from the no. 2 engine PT2 line. This debris may have caused the abnormally high EPR seen during the incident.

## Flight Recorders

The aircraft was fitted with a 5 parameter Arinc 542 (foil) Flight Data Recorder (FDR) and a 4 channel Cockpit Voice Recorder (CVR). The FDR was not replayed. The CVR installation was to FAA standard resulting in crew conversation being available only from the Cockpit Area Microphone (CAM) channel. The quality of the recorded speech was unacceptable due to excessive wear of the recording heads and accumulated tape debris in the tape transport mechanism.

## Gatwick Weather

Weather observations for Gatwick airport are broadcast on the ATIS radio frequency. The relevant data from the broadcasts immediately before and after the incident are reproduced below:

| Time | Mean Wind | Wind Variations | Cloud | Temp | QNH |
|---|---|---|---|---|---|
| 1315 hrs | 170°/15 kt | Direction between 130° & 210° | 1 okta 1500 ft | +12°C | 1008 mb |
| | | Max 27 kt min 07 kt | 5 okta 2000 ft | | |
| 1345 hrs | 170°/14 kt | Direction between 110° & 220° | 2 okta 1600 ft | +12°C | 1007 mb |
| | | Max 26 kt min 06 kt | 5 okta 2000 ft | | |

The crew used the 1315 hrs report in their pre-take-off calculations. The reported mean wind was a direct crosswind but well within the aircraft's 25 kt crosswind limit for take-off. However, there was the possibility of the crosswind component exceeding this limit if a southerly gust exceeded 25 kt, as it had done at some time during the 10 minutes prior to the 1315 hrs and 1345 hrs observations. (The precise direction of the gusts was not specified in the reports nor was there any requirement to do so). Analysis of the Gatwick anemograph recording for the period 1300 hrs to 1400 hrs showed 18 gusts to 20 kt or more and confirmed the maxima, minima and mean direction reported in the 1315 hrs and 1345 hrs observations. One gust reached 25 kt (the limit for the DC-8) at about the time of the high speed abort but the accuracy of the anemograph timebase is such that correlation of this gust with the abort should not be assumed. When the crew lined up for their second attempted departure, the air controller reported the wind as 180°/13 kt. Immediately after observing the start of the high-speed abort he reported the wind as 160°/15 kt.

At Gatwick, wind velocity is sensed by a single anemometer sited 200 metres south of runway 26L adjacent to a point 2240 metres from the threshold. It is close to the southern boundary of the airport which is bordered by extensive mature trees to the south and southwest of the anemometer position. Operational experience, confirmed by pilot reports, suggests that anemometer readings may be significantly in error when strong winds blow from a southerly direction because of local airflow disturbances caused mainly by the trees. However, a meteorological aftercast prepared by the Bracknell office based on synoptic charts concluded that the mean surface wind at Gatwick would have been 160°/15 kt with gusts to 28 kt and a variable direction between 140° and 200°; this assessment is consistent with the Gatwick observations. Moreover, the Heathrow observations for the same period showed similar characteristics; there the mean wind velocity was 160°/17 kt with gusts to 28 kt and variations in direction between 110° and 190°.

Repeater dials in the Gatwick Visual Control Room allowed controllers to pass instantaneous wind information to aircraft. These dials did not present controllers with any record of mean wind velocity or maxima and minima. Equipment which automatically logged the spread of wind direction and speed during the previous two minutes was on trial in the Tower at the time of the incident but was not approved for use. This equipment will be approved once software problems have been resolved.

Plans to re-locate and duplicate the anemometer at Gatwick are in-hand and will be executed once compliance with Appendix B of the recently issued CAP 573 is confirmed. These plans, coupled with the new computerised wind displays, should ensure that ICAO Annex 3 requirements for "the best practical indication of the winds which an aircraft will encounter during take-off and landing" are fulfilled.